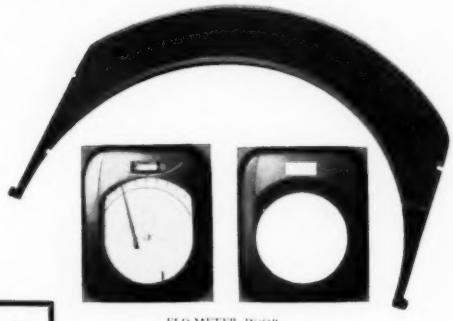
MODERN PLASTICS

JUNE 1952

They found new ways to KEEP COSTS DOWN

ELECTRIC CORN POPPER
Popex Inc.



FLO-METER DOOR
Penn Industrial Instrument Corp.

ONE-PIECE CASE
L. C. Smith and Corona Typewriters, Inc.

COLOR SLIDE VIEWER
The FR Corporation

...with custom-molded DUREZ phenolics

From all directions the news rolls in from Durez phenolics users . . . and it's *good* because it's news of costs saved in product development, improvement, and redesign . . .

Formerly 19 assembly operations . . . now six.
Inexpensive insert makes "new" model.
Tool and jig requirements slashed.
Finishing eliminated.

Reports like these point up a thought to have in mind when *your* products are in the making . . . it pays to talk things over with your custom molder. He has the know-how that translates new ideas into molded Durez. His equipment is large enough for big moldings and is getting larger all the time.

Of course the plastic must have good flow and strength properties to permit wide freedom in design for molding. Durez has both . . . and it offers your engineers eight distinct classes of phenolics among which they can select the mechanical, electrical, and chemical properties that fit their specifications.

Our technicians can aid you with specialized knowledge of these materials and their use. Call them any time.

Our monthly "Durez Plastics News" will keep you informed on industry's uses of Durez. Write, on office letterhead, to Durez Plastics & Chemicals, Inc., 1206 Walck Road, North Tonawanda, N. Y.

PHENOLIC PLASTICS THAT FIT THE JOB

—from *Catalin Styrene*, a *joyous moment is molded into a lifetime endearment*

It is their Wedding Day! High, high on an enchanting, lacy, white cloud, the lovely bride and proud groom have joined hands; around them, their orange blossoms and lily of the valley; below them, their billowy sugar-encrusted wedding cake mountain; and above them, their love bird, who most certainly is chirping "Cut the cake, cut the cake"! Presumably, too, the traditions of this delightful moment have called for the music and chant of "The Cake Song".

In the brilliantly decorative and truly crowning beauty of CATALIN STYRENE, a romantically inspired molder*, as portrayed above, has captured the spirit of the occasion in a way that not only "takes the cake", but keeps the memory of the reception forever fresh in the hearts of the newlyweds. Ornamentally and sentimentally, this wedding cake pinnacle will continue to enjoy a revered place in the home through many, many happy wedding anniversaries.

**Molded and marketed by Leon D. Bush 4250 W. Diversey Ave., Chicago 39, Ill.*

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

CATALIN

In addition to Styrene Molding Compounds, Catalin's chemical family includes a wide range of Urea, Phenolic, Cresylic, Resorcinol, Melamine and Styrene Resin formulations.

MODERN PLASTICS*

VOLUME 29 JUNE 1952 NUMBER 10

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* Reg. U.S. Pat. Office

Another new development using

B. F. Goodrich Chemical *raw materials*

pipe dream comes true!

Plastic development stops pipe joint leaks—in or out!

● The workman pictured here is installing the kind of leak-proof pipe joint some men dreamed about—but one that an enterprising manufacturer made come true!

Vinyl plastisol based on Geon is cast directly on extra-strength, premium grade Vitrified Clay Pipe, with the outer surface molded to a tapered thread. Lengths of pipe are then joined together by a phenolic collar with matching threads. This phenolic collar is threaded over the Clay Pipe end, and the pipe to be joined is fastened securely with a few simple turns. Result—a Geon-sealed pipe joint that permits nothing to leak in or seep out!

The plastisol provides all the advantages that Geon materials bring to so many successful products—from durable flooring and electrical insulation to rigid paneling. For Geon materials can be made tough as you like . . . resistant to heat and cold, water and grease . . . withstand abrasion, most chemicals and gases. They can take brilliant or delicate colors.

Geon materials have helped turn many "dream" products into saleable ones. Perhaps they can help you improve or develop a product. For helpful technical bulletins or advice, please write Dept. GA-6, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, O. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

B. F. Goodrich Chemical Company does not make this pipe joint. We supply the Geon resin only.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors

NEED PLASTIC PARTS THAT CAN TAKE *PUNISHMENT?*

Do you have an application where toughness and resistance to shock are essential? Must the part withstand sharp impact? Must it resist the action of water . . . or oil . . . or chemicals?

If you're confronted with any or all of these problems there is a good chance that the right plastic materials can help you. For example:

(A) The washing machine agitator has to stand continuous mechanical stress in use. At the same time it must resist moisture and the chemical action of soaps and detergents. The specially formulated phenolic material yields outstanding performance.

(B) Here's a searchlight handle that must withstand sharp physical shock. The rubber phenolic material from which it is molded can really take it!

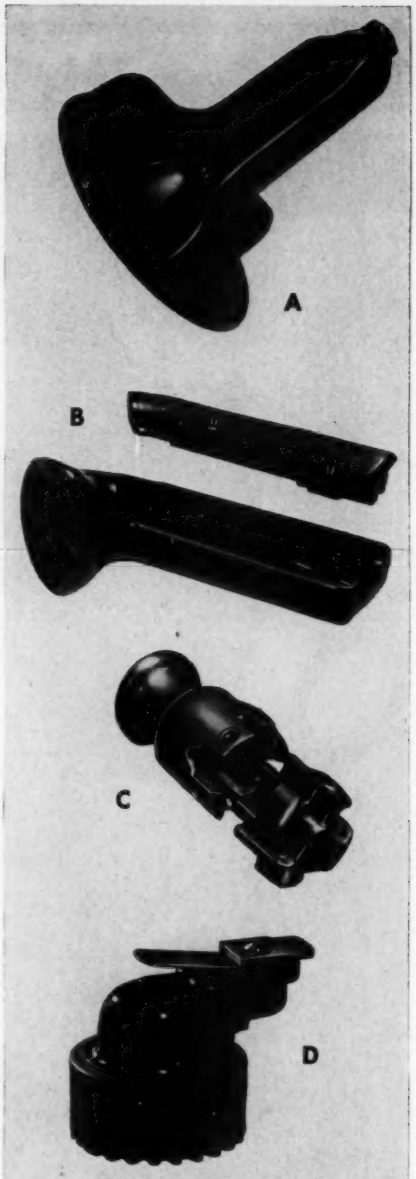
(C) This automotive brake plug is at times subjected to both physical shock and severe mechanical stresses. For this application, a canvas filled phenolic has proven highly successful.

(D) This distributor rotor withstands gear friction, ignition voltage, and the rugged service given every component in a farm tractor. Here again a phenolic plastic, properly chosen, does an outstanding job.

Getting the right material for the job is a big step in the success of any plastic application. And in choosing the one best material for the job, from the hundreds of materials and formulations now available, there is no substitute for experience.

For more than thirty-two years Chicago Molded has been solving problems like these—and hundreds of others—for many of America's largest users of plastics. That same seasoned know-how is available to you in perfecting the details of your plastic molding job. Chicago Molded's service extends to every step in the molding process—from design for molding through tool making, production, and finishing, down to the last detail of the molded component, ready for assembly into your product.

There is not the slightest obligation in talking over your needs with a Chicago Molded engineer. For prompt action, just write, wire, or phone.



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PRODUCTS CORPORATION

1046 N. Kolmar Ave. Chicago 51, Illinois

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and mail it to us. We'll put you on our mailing list to receive "Plastics Progress", an interesting and informative publication containing articles about current plastic molding jobs as well as other factual data of value to the user of plastics. There's no charge or obligation.

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EDITORIAL

Competition Coming Up!

Every business section of every newspaper, every news section of every industrial magazine, every production authority report from Washington, every company annual report for months past, has told the story of physical plant expansion. This nation is due to find itself equipped, within the next few months, with a production machine the size of which could not even have been dreamed of ten years ago.

Practically no materials are going to be scarce. Even now, the situation is easing in aluminum, in steel, in lead, even in copper. Rubber is in more than ample supply. All plastics, with the exception of the fluorocarbons and polyethylene, are available on short order. And, as indicated in our Plastiscope section this month, present and projected chemical plant expansion to serve the plastics industry is fabulous in size and scope.

We've got a bigger and better physical plant. But our "sales plant" in practically all industry is pitifully weak in proportion to the distributive requirements of that physical plant. According to J. M. McKibbin, vice president of Westinghouse, the number of salesmen in this country has increased only 18% in the last ten years, while the physical volume of goods sold increased 80%.

Furthermore, the quality of our sales plant has not been improved proportionately, because since the close of World War II and until recently—except for short periods of slight recession—everything has been easy to sell.

So here we are, with the greatest production facilities in history, but with sales organization geared to a production machine much smaller than we now have, geared to a backlog of demand, geared to a sellers' market, geared to shortages.

It's an obvious corollary that the bigger your production machine and the faster it runs, the more efficient your marketing mechanism must be, because if the things made in huge quantity and at high speed are not gotten out of the way and into use, they'll clog the machine.

Competition is coming up! It's here now. And it won't be competition in price, because the present financial structure of industry, present tax regulations, and present and prospective wage levels, will not permit straight price competition. It will be competition in salesmanship, between materials, between products, and between makes or brands of products.

A lot of fundamentals have been forgotten and must be relearned. Radical new product development for new needs will have to be instituted. Careful and clever new market development is the only thing that will open up new needs. Promotion and advertising geared to the pace and volume of our production must be used to keep the machine running. Most important of all, sales forces must be expanded, trained, and kept at pitch.

In all fabricating industries—in metal, rubber, and others as well as plastics—there has developed an inclination to leave the opening up of new markets to basic material makers. With increased competition, it will be up to each and every processor, molder, and fabricator to pull his own weight in sales development by means of his own promotion, his own market research, and his own sales operation.

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now available!

metal-clad

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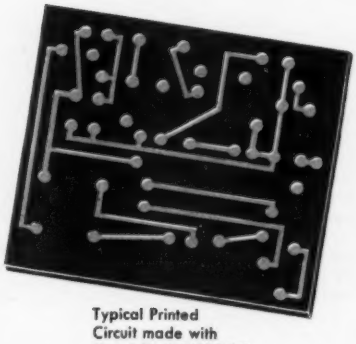
plastic laminates

Laminated INSUROK Grades T-725 and T-812 have made history ever since they were first introduced to the electronics industry. These laminates, possessing a unique combination of properties, have shown sensational performance in critical high-frequency applications.

Now these superior electrical laminates are available in *Metal-Clad* form (with copper or aluminum sheet bonded to one or both surfaces) for the production of "printed circuits."

Metal-Clad INSUROK exhibits outstanding electrical properties which remain remarkably stable under repeated temperature and humidity cycling. In addition, it possesses high physical strength and low cold flow, and punches readily into intricate shapes. The metal foil is bonded by a special process assuring consistently higher bond strengths than ever offered before.

Samples of Copper or Aluminum-Clad INSUROK are available for testing purposes. Send for complete information, today.



Typical Printed Circuit made with Metal-Clad INSUROK

The RICHARDSON COMPANY

FOUNDED 1858—LOCKLAND, OHIO

2789 Lake St., Melrose Park, Illinois (Chicago District)

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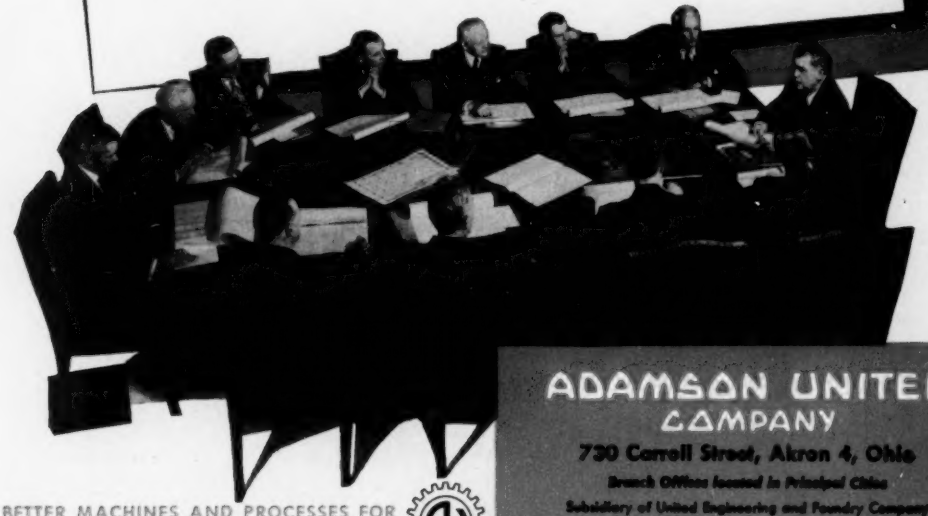
Let's sit down——— ——and talk things over

Here at Adamson we've been doing something that we believe is rather unique in the industry. Every now and then a manufacturer of rubber or plastics has expressed a desire to discuss certain problems pertaining to calendering or calendering equipment, and we have invited him and his associates to our conference room for a roundtable session with our staff. No one dreamed the idea up—it just grew. Some of the largest manufacturers in the industry have been our guests and have described the meetings as helpful and enlightening.

Certainly, since we build calenders and related equipment, these clinics have been of great value to us. And because we believe that a free exchange of opinions and ideas is the surest way to promote progress and improvement in any industry, we extend to you and your company a cordial invitation to our conference room. Perhaps, like the famous riddle of which came first, the chicken or the egg, many questions will have to be left unanswered, yet the benefits to be derived from a free discussion of our common problems cannot fail to be mutually helpful.

Why not 'phone or write us for a conference date? The obligation will be all ours.



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PUSH-ON SPEED NUTS®

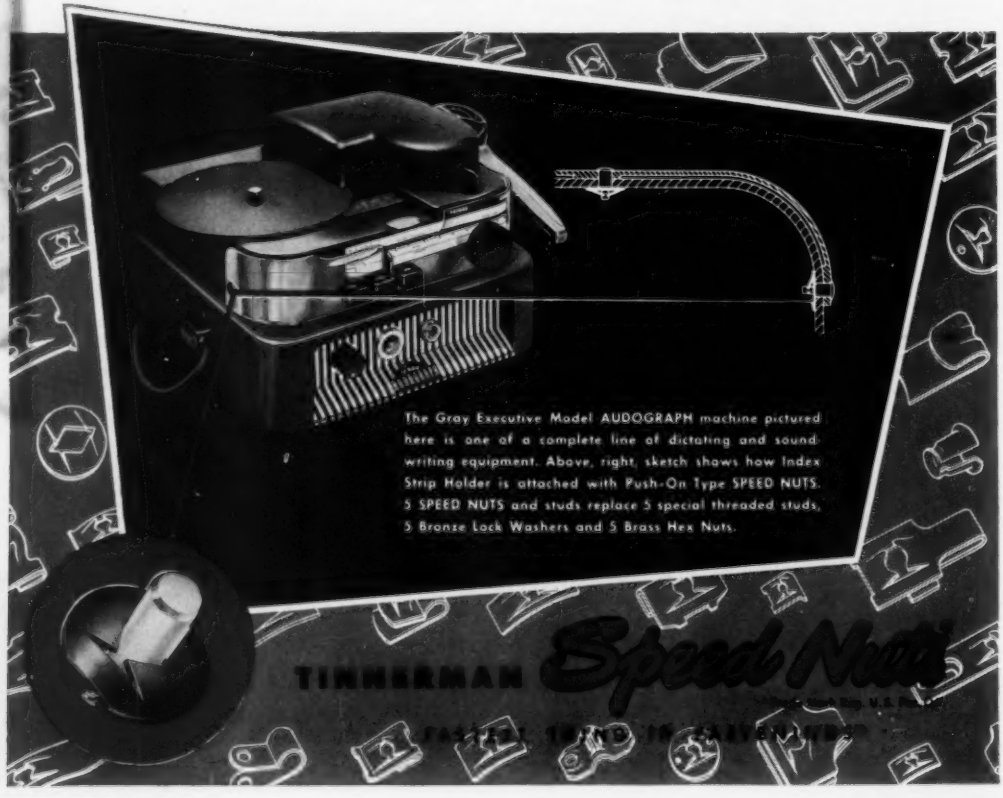
Make New Record

FOR GRAY AUDOGRAPH

Here's how SPEED NUTS made a 50% savings in time, and a 75% material savings in the assembly of Gray AUDOGRAPH Dictating Machines . . .

Engineers at Gray Manufacturing Company took a second look at the index strip on their Audograph Machine and this is what they found. Five standard Tinnerman Push-On Type SPEED NUTS could be zipped over plain studs to attach the complete Index Strip Holder Assembly in half the time . . . replacing hex nuts, lock washers and eliminating special threaded studs.

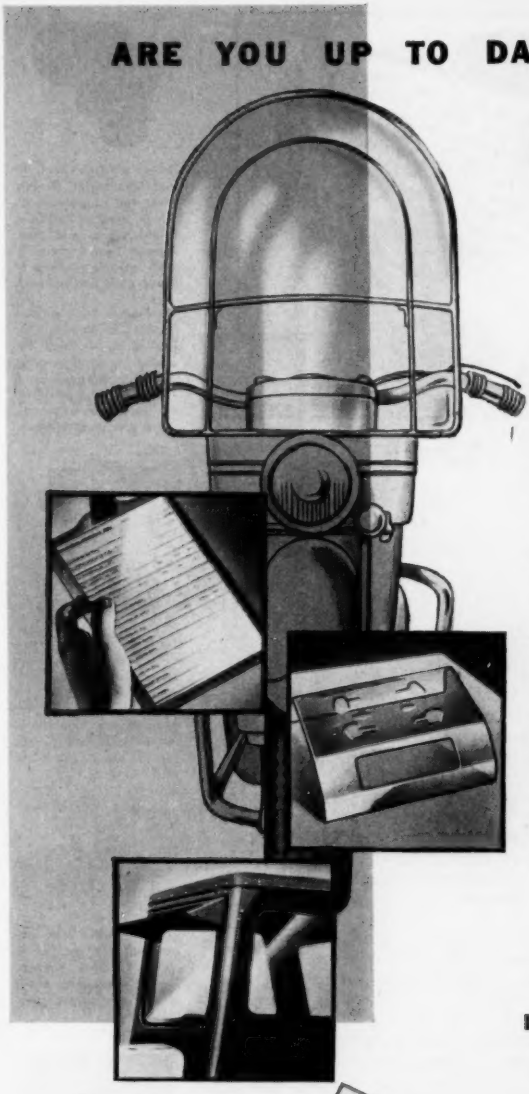
This is just one of the many SPEED NUT Savings Stories being reported every day in a wide variety of industries. Take a second look at some of your assembly operations with an eye to keeping costs down and quality production UP; your Tinnerman representative is prepared to help. SPEED NUTS are the most economical fasteners ever developed—to prove the point, we'd like to make a comprehensive Fastening Analysis of your product line. In the meantime, write for your copy of SPEED NUT Savings Stories, TINNERMAN PRODUCTS, INC., Box 6688, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners, Ltd., Hamilton. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S. A.—7 rue Henri Barbusse, Levallois (Seine) France.


The Gray Executive Model AUDOGRAPH machine pictured here is one of a complete line of dictating and sound-writing equipment. Above, right, sketch shows how Index Strip Holder is attached with Push-On Type SPEED NUTS. 5 SPEED NUTS and studs replace 5 special threaded studs, 5 Bronze Lock Washers and 5 Brass Hex Nuts.
TINNERMAN
Speed Nut

ARE YOU UP TO DATE ON ACETATE?

Celanese* Acetate Sheeting

for *GLAZING*



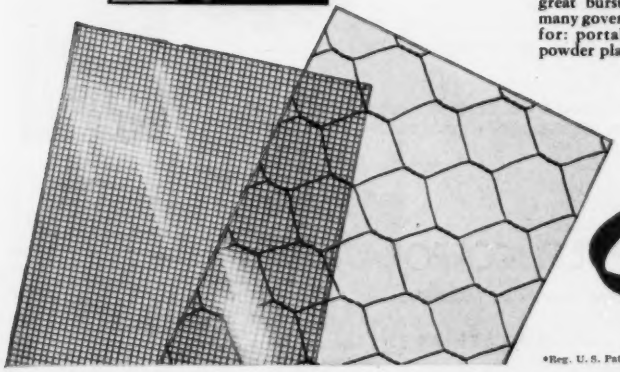
Toughness and Transparency. Celanese acetate sheeting has the impact and tensile strength to meet the most rigid specifications.

Easy to fabricate. Celanese acetate sheeting scores easier, blanks perfectly, draws and forms readily, machines without crazing.

Economical. Celanese acetate sheeting can be used in thinner gauges because it is tough. This means more sheet area to the pound. It is available in various sheet sizes and roll lengths to give you less blanking waste. Write today for your copy of Sheeting Booklet now on the presses. Celanese Corporation of America, Plastics Division, Dept. 101-F, 180 Madison Avenue, New York 16, N. Y. In Canada, Canadian Cellulose Products Ltd., Montreal and Toronto.

■ **Lumapane***

Wire-reinforced laminate providing high degree of transparency with great bursting strength. Specified in many government glazing applications for: portable buildings, hutments, powder plants, etc.



Celanese* Acetate PLASTICS

*Reg. U. S. Pat. Off.

Tupper Seal, air and liquid tight flexible covers fit, and are included in the sets of all Tupperware Canisters.

Argentine Patent 74,095 dated Dec. 14th, 1949 on invention covered by U. S. Patent 2,487,400 November 8, 1949. Canada Patent 463,387 Feb. 28th, 1950. Union of So. Africa Pat. 8,592 Sept. 21st, 1949. Belgium Pat. 491,293 Oct. 15th, 1949. Switzerland Patent 48,970 Sept. 23rd, 1949. Italy Patent 456,937 September 19th, 1949. Other U. S. and Foreign Patents Pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.

The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.

FORMAL NOTICE! 9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S.Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

TUPPER CORPORATION

The Tupper Seal, air and liquid-tight, Pour All cover as a cover for 46 oz. cans; Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.

There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12½ oz. Tumblers too, and these Tupper Seal, covers fit many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Por Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.

The cover of the Tupperware Bread Server which serves as a bread tray also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.

When equipped with Tupper Seal, air and liquid-tight, flexible covers, Tupperware Cereal Bowls serve many another purpose.

The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnels as a base when funnels are used as storage containers.

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Manufacturers of — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas **New York Show Rooms 225 Fifth Ave.**

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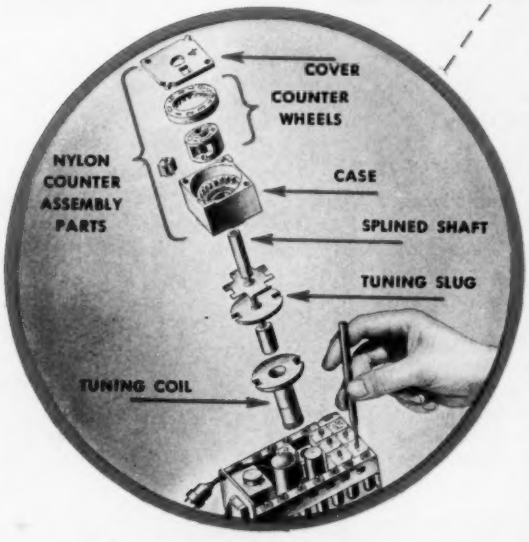
Molded Du Pont nylon parts in miniature radio set



Nylon parts molded by Brilhart Plastics Corp., Mineola, L. I., N. Y., for Utility Electronics Corp., East Newark, N. J.

DU PONT

150th Anniversary

Better Things for Better Living
... through Chemistry

Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

Permit rapid, easy and accurate tuning under all conditions

A unique feature of this new Signal Corps miniature radio set is a series of tuning assemblies molded of Du Pont nylon. These small units permit the operator to adjust frequencies quickly and simply . . . with a screw driver . . . even under the most difficult field conditions.

Frequencies are controlled by the adjustment of seven tuning slugs, each of which has a splined shaft engaging a nylon counter assembly. As each slug is moved in and out of its tuning coil, its mating counter wheels turn. Since the wheels register from 1 to 99, an infinitesimal adjustment of the tuning slug is indicated numerically on the wheels.

Each counter assembly is made up of five intricately designed nylon pieces, as shown in the exploded view. Du Pont nylon is used because it provides the necessary electrical insulation . . . can be injection-molded into thin sections with sufficient toughness to give virtually foolproof performance. For example, the tiny splines on the inner circumference of the counter wheels must be tough enough at −40°F . . . rigid enough at 130°F . . . to give satisfactory operation.

Du Pont nylon gives other advantages, too. Because of its resiliency, nylon provides self-locking action on the small screws used to fasten the cover. The plastic is light in weight, a critical factor in portable equipment. And injection-molded nylon parts are economical.

This is another example of Du Pont nylon's outstanding performance as an engineering material. Perhaps its unusual combination of properties—including toughness, abrasion resistance, form stability, lightness of weight—can help create a new product or improve a present one. *Du Pont nylon is available.* For further information, write:

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, District Offices:
350 Fifth Avenue, New York 1, N. Y.
7 S. Dearborn Street, Chicago 3, Ill.
845 E. 60th Street, Los Angeles 1, Calif.

an exclusive product of MPM...

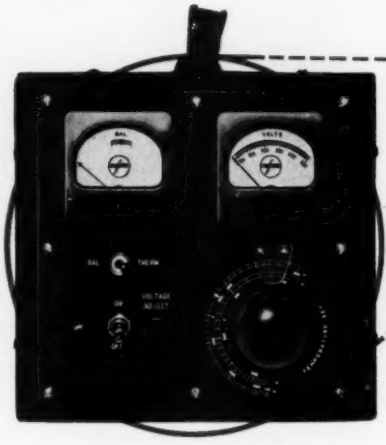
NEW ELECTRONIC

- ***continuous stepless temperature regulation for all electrically heated equipment***
- ***closer control than available by any other means***
- ***no moving parts, relays, switches, valves contacts, motors, photocells***
- ***handles voltage load changes which vary as much as five to one***

This triumph of electronic engineering, the revolutionary MPM-101 Electronic Heat Controller can provide electrically heated injection and extrusion machines with foolproof automatic temperature control . . . to closer limits than ever before possible under production conditions.

The MPM-101 entirely eliminates "on" and "off" operation and substitutes continuous stepless regulation of temperature; there is never an over-riding of desired temperatures, nor is there a lag between the time heat is called for and delivered.* Immediate and direct results of the unit's installation will be reduction of scrap and off-size extrusions, better tolerances and the need for less attention from the operator.

Current changes and indication of the maintenance of proper temperature are shown continuously on two meters. Once balanced, the instrument supplies the exact degree of heat required for a specific application. At all times the operator is able to tell how much wattage is being consumed by the various heat zones. You can obtain full details on the MPM-101 Electronic Heat Controller and its other advantages by writing to us without delay. Find out about this money-saving, production-increasing unit now.

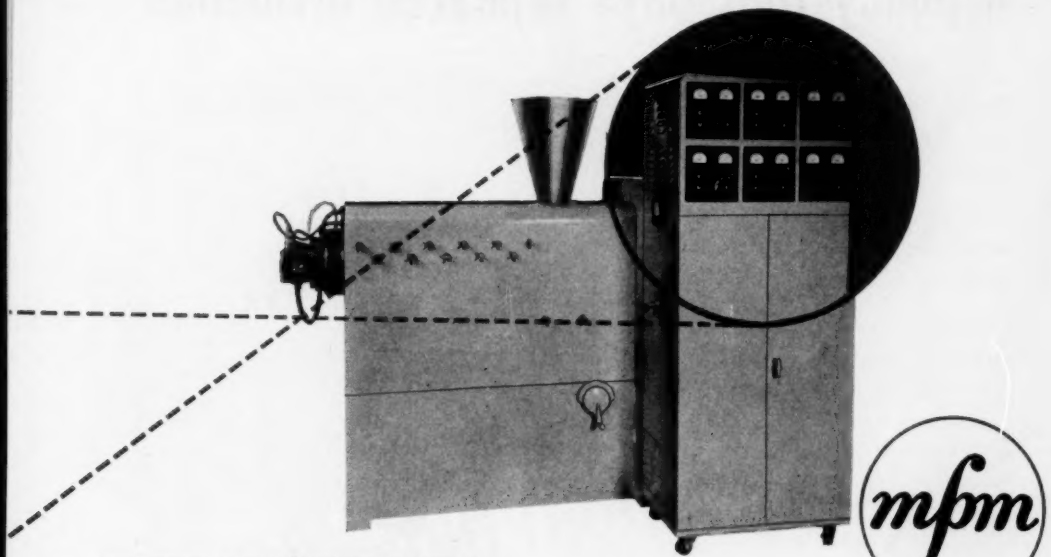


The MPM-101 Electronic Heat Controller is adaptable to certain other makes, sizes and models of extrusion and injection molding machines. Instruments now in production range from 350 watts to 5 KW. Standard units come in 1500, 3000 and 5000 watt ranges.

The "brain section" meter of the MPM-101 Electronic Heat Controller monitors the changes in the circuits of the heater elements so the proper amount of heat is provided—neither too little during a voltage drop, nor too much during cooling to remove frictional heat. The "control section" meter tells whether the right temperature is being maintained. Each section is a separate unit. One "brain section" will supervise up to ten "control sections", each of which may range to 5000 watts—for a possible total of 50 KW.

*When excessive frictional heat is developed in MPM extruders, multiple radial cooling zones are provided to hold the temperature at a level required to permit proper action of temperature controllers.

HEAT CONTROLLER



This illustration of the 3½" MPM extruder shows the MPM-101 Electronic Heat Controller which is available for installation in earlier MPM extruders of every size.

The new MPM-101 Electronic Heat Controller is now available as factory-installed equipment on all future deliveries of MPM extruders.* Our sincere belief, based on months of experimentation, is that this remarkable instrument provides the way to superior extruded products at lower cost.

Even the finest controls heretofore obtainable subjected the material being extruded to considerable temperature variations during certain extrusion applications. The MPM-101, being constantly in operation and on guard, holds the temperature of the material within a very close range, regardless of the application.

Since the compounds are extruded at precisely the correct temperature, bubbles, burned or distorted sections, and off-dimension lengths are reduced to an absolute minimum. The instrument regulates the temperature practically unaided. Less attention is required and the operator can tend a greater number of extruders.

When you consider the value of the MPM-101 Electronic Heat Controller in conjunction with the other well-known MPM superiorities—solid corrosion resistant interior parts, simplified installation, built-in speed indicator, multiple cooling zones—you certainly will want further information. It will be sent promptly, at your request.

*Where such extreme accuracy of heat control is not absolutely necessary, standard MPM heat controls will be furnished.

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX

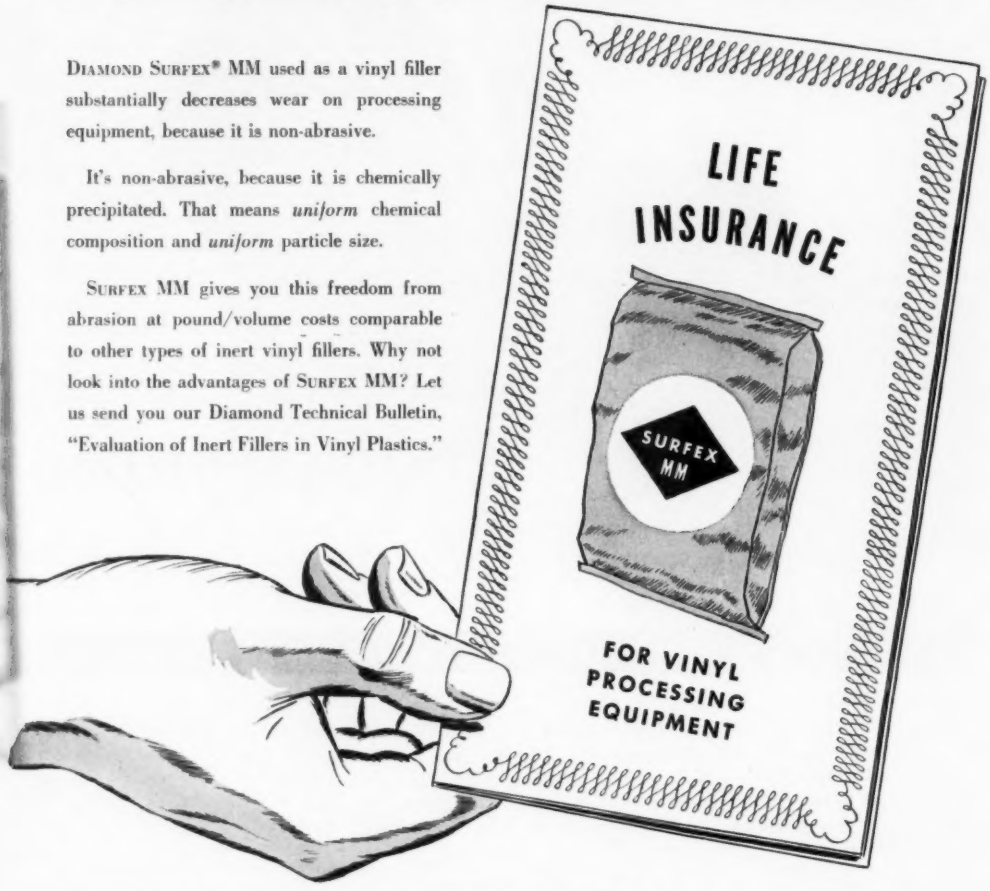
Chemicals you live by

A policy that pays repeated dividends

DIAMOND SURFEX® MM used as a vinyl filler substantially decreases wear on processing equipment, because it is non-abrasive.

It's non-abrasive, because it is chemically precipitated. That means *uniform* chemical composition and *uniform* particle size.

SURFEX MM gives you this freedom from abrasion at pound/volume costs comparable to other types of inert vinyl fillers. Why not look into the advantages of SURFEX MM? Let us send you our Diamond Technical Bulletin, "Evaluation of Inert Fillers in Vinyl Plastics."



DIAMOND SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis and Houston. Also, representatives in other principal cities.

DIAMOND DISTRIBUTORS: C. L. Duncan Company, San Francisco and Los Angeles; Van Waters and Rogers, Inc., Seattle and Portland, U. S. A.; Harrisons & Crosfield (Canada) Ltd.

DIAMOND CHEMICALS FOR BETTER VINYLS

DIAMOND ALKALI COMPANY...CLEVELAND 14, OHIO

DIAMOND ALKALI CHEMICALS®

W-S PREPLASTICIZERS

mold more... FASTER

with present equipment.

Yes, the fastest way to increase the productive capacity of your plant, is to install on your present injection molding machines – Watson-Stillman PREPLASTICIZERS.

Years away from the experimental stage, W-S modern PREPLASTICIZING Units are designed and built to mount right into position on present machines, and when installed, they give you the following advantages in your molding operations:

1. *Shorter Molding Cycles* . . . In many cases cycles can be cut one-third to one-half.
2. *Piece weight savings* in a great number of cases can be *immediately* realized.
3. *Better Moldings* . . . Because the material in the shooting cylinder is completely plasticized at the start of the injection stroke, injection pressures in most cases can be reduced fifty percent or more, resulting in strain-free moldings and less rejections.
4. *Thinner Sections possible* . . . Wherever warranted, thinner sections are obtainable by means of using maximum injection pressure on the plasticized material without the pressure restriction caused by the torpedo.

And . . . don't forget, WATSON-STILLMAN has been building PREPLASTICIZERS for years and offers a complete line of these units for all E–Series injection molding machines. Let us tell you more about them. Write today.

W-S HYDRAULIC

9-M-31

HYDRAULIC MACHINERY DIVISION

ROSELLE, NEW JERSEY

WATSON-STILLMAN

ESTABLISHED 1848

W-S "COMPLETELINE"—SHORTEST DISTANCE FROM PRODUCTION TO PROFIT

We're Basic every step of the way!

When we say we're basic from coal to plasticizers, we *mean* basic! For we're able to control every step of our production from the time our coal is mined until we actually ship the finished plasticizer to your plant.

What's more, our completely integrated plant is strategically located at Neville Island, on the headwaters of the Ohio River near Pittsburgh, Pa., where coal and other raw materials are in plentiful supply.

What does this basic position mean to you? For one thing, it means you can count on Pittsburgh Coke & Chemical for dependable supplies.

Then too, the uniformly high quality that results from our close, step-to-step control of every phase of plasticizer production assures you consistent peak plasticizer performance and improved characteristics in your finished plastic products. That's why it pays, *in every way,* to buy plasticizers from a basic producer.

Get your FREE copy of this new book!

Contains valuable data on the plastics industry, the role of plasticizers in the industry, and descriptions and recommended applications of Pittsburgh PX Plasticizers. *Write for your copy today!*

WBD 4206

PLASTICIZER DIVISION

PITTSBURGH COKE & CHEMICAL CO.

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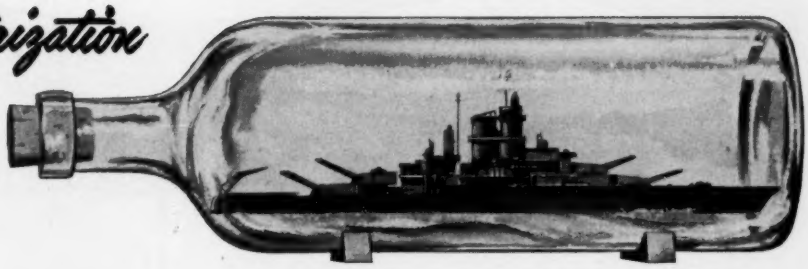
COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Miniaturization



Mighty Midgets in Plastics

For the newest important developments on the plastics front, look to the intensive miniaturization program underway in the electronics and communications fields. Working, in this case, through the vast resources of RCA, the program calls for intense miniaturization in size, and reduction in weight, of physical components. Idea, of course, is to produce smallest, lightest, assemblies possible–with greatly improved efficiency–for a scope of use impossible with unwieldy old equipment.

What a made-to-order spot for plastics! And for a moulder! The terminal boards, insulators, coil cases and covers (shown here actual size) have tolerances so close that in some instances, they are machined to final dimensions. There are wall sections as thin as .012". Inserts are fine Swiss screw machine plated parts with exacting thread fits assembled to microscopic dimensions. Materials are low-loss mica-filled phenolics.

There's a production story here, too! With such necessary precision, commercial production was at first thought to be impossible. Within three weeks, we produced experimental tooling and a production method using compression and plunger techniques along with a combination of the two. *And then, carefully analyzing our experimental program, we designed and produced production tooling–and are now meeting production quotas and rigid inspection with commercial moulding methods!*

We can't offer you a better recommendation. For small parts–or large ones–we can put lots of experience at your disposal.

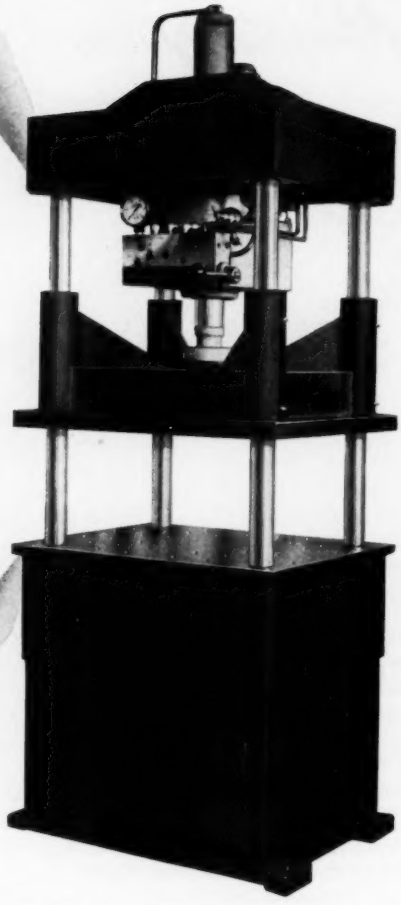
Kurz-Kasch, Inc. • 1415 South Broadway • Dayton 1, Ohio

Branch Sales Offices: New York, *Lexington 2-6677* • Rochester, *Hillside 4352* Chicago, *Harrison 7-5473* • Detroit, *Trinity 3-7050* • Philadelphia, *Granite 2-7484* Dallas, *Logan 1970* • Los Angeles, *Richmond 7-5384* • St. Louis, *Delmar 9577* • Toronto, *Riverdale 3511* • ***Export Office:*** 89 Broad Street, New York City, *Bowling Green 9-7751.*

Kurz-Kasch

FOR OVER 36 YEARS PLANNERS AND MOULDERS IN PLASTICS

DAKE PRESSES for Compression Molding



This 25-ton air-operated press with 4-post guided platen is typical of the Dake Hydraulic Presses which serve the plastics industry. These presses are built up to 300-ton capacity and can be engineered to meet your individual requirements.

The press above is a type used for compression molding of Fiberglas laminates, and can be set to operate at any pressure within its range. These presses are available with thermostatically-controlled heated platens.

We will welcome an opportunity to discuss your compression molding problems, and quote on equipment engineered to your special needs.

Dake Engine Company, 648 Seventh St., Grand Haven, Mich.

DAKE PRESSES

ANY SIGN THAT'S USED TOO LITTLE COSTS TOO MUCH

Data courtesy Borkland Mfg. Co., a division of Borkland Laboratories, Marion, Indiana.

Standout displays get used

They're the kind of displays that dealers want—and use and use and use! Colorful, lightweight, durable, three-dimensional—they make smart promotion a bargain!

That's because they're made from tough, flexible VINYLITE Brand Plastic Rigid Sheets—printed flat in four colors, then heat-formed to attractive shapes and fine details. They won't break, crack, fray or fade with use. A damp cloth wipes them clean.

And they're striking illustrations of the properties of VINYLITE Rigid Sheet, so practical for a great many other uses . . . as doll faces, easily molded, realistically colored . . . dress dummies, durable and light in weight . . . lampshades that are translucent, skillfully designed and printed. Relief maps formed from VINYLITE Rigid Sheet stand up under frequent handling, washing, and exposure to weather . . . drafting equipment, dials and precision instruments keep their shape despite temperature and humidity, and resist perspiration, chemicals, and oil.

VINYLITE Rigid Sheet materials may be transparent, translucent, or opaque, with an unlimited range of colors. They are now being used to develop scores of new designs and products. They have the qualities that make VINYLITE Resins and Plastics so useful to defense and basic industry. Use them to make your product a standout. Tell us of your problem and write for a list of suppliers to Dept. MY-7.

Vinylite
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TRADE MARK

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A Division of
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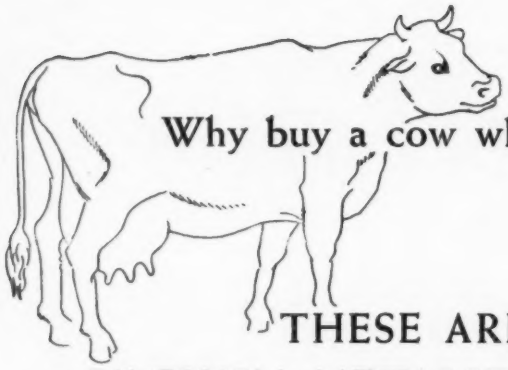


Why buy a cow when milk is so cheap!

THESE ARE THE FACTS ABOUT VACUUM METALIZING PLASTIC PARTS:

NOTE: *These facts are presented by a firm that has vacuum metalized over 50 million parts in the past 3½ years . . . as a pioneer and leader in this field, Vacuum Metalizing Corporation is regarded as one of the country's leading authorities in high vacuum distillation for volume production.*

It is common knowledge that a single 48" vacuum chamber and all the other necessary equipment to metalize plastics costs anywhere from $50,000.00 to $100,000.00. But let's forget this investment. Pretend you have this machine and other equipment installed and paid for . . . running smoothly in your plant.

Your *direct cost* to run this vacuum operation in your own plant is $14,000.00 a month . . . this is the cost for power, materials, rent, labor, insurance and a supervisor . . . to run 20 *loads a day*, 5 days a week. Let's say, with luck and a minimum of break-downs, you metalize 400 loads a month. Four hundred loads a month at a cost of $14,000.00 equals thirty-five dollars *($35.00) direct cost, per load.*

Now, *here's the hitch.* One of the manufacturers of equipment claims as much as 5 loads per hour . . . 12 minute cycles or 2,000 loads per month. On this basis, if you were metalizing miniature trophies, processing 1080 per load, as we do, you would metalize over 2,000,000 with *one machine in one month. Even if this were possible* we can't imagine selling that kind of capacity.

After running many, many, thousands of cycles each year, our records show the average load to take 62 minutes. But, *we do not have the latest type pumps* on our machines. However, the manufacturers of vacuum equipment, who do claim as much as 5 loads per hour do not take into account that the equipment becomes contaminated *when put into regular production* and that very soon after *the cycle lengthens appreciably.* As an example, when each of our present units was new and clean initial pumping cycles at no load were less than 10 minutes.

Closing our eyes to experience, and hoping for the best, we have purchased the latest type pumps which we will install on one of our chambers. Before buying these pumps, however, we were taken to a plant using them *in production.* They were providing 3 *cycles an hour.* But the work load (number of pieces in the chamber) was less than ½ our regular load.

In spite of this, we are more than anxious to see these new pumps provide faster cycles with our regular loads.

We have always made it our policy to cram in as many pieces as possible to get the price down . . . for we are always conscious of the fact that our success depends on the success of our customers.

With all our equipment, experience and know-how and newly-built addition which more than doubles our plant size, we proudly make this offer:

Better quality plastic metalizing at less cost than in your own plant.

VACUUM METALIZING CORPORATION

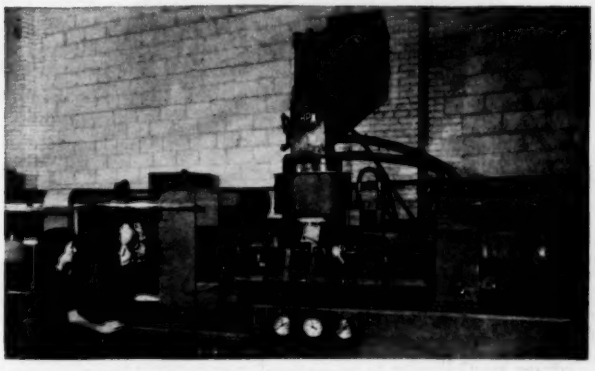
Long Island City

New York

AMERICA'S LARGEST VACUUM INSTALLATIONS • MASS PRODUCING AT LOWEST COST

"Money in the Bank!"

with H-P-M Pre-Plasticizing Injection Molding Machines



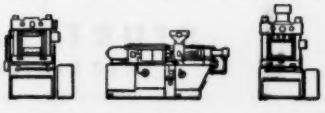
An H-P-M Model 350-P-32 pre-plasticizing injection machine molding piggy bank halves on a 27 second cycle at Ideal Plastics Corporation, Hollis, New York. This shot was formerly molded in a 22 oz. conventional machine in 36 seconds . . . a 9 second saving on every part with H-P-M pre-plasticizing.

● This little piggy really went to market for Ideal Toy! H-P-M pre-plasticizing produces 800 more piggy banks per day with a 10% reduction in rejects. This is a real saving when you consider that each shot has a projected area of 110 sq. in. and weighs 12 ozs. (based on molding Polystyrene).

Many installations have proven that H-P-M pre-plasticizing offers the injection molder terrific cost saving advantages with greatly improved product . . . each part weighs up to 10% less and is relatively strain free . . . cycle time is increased as much as 100% . . . there's no chance of burning material . . . mold release is easier . . . dry coloring greatly improved. For the complete story on pre-plasticizing, write for a free copy of H-P-M Bulletin 5206.

HPM

PLASTICS MACHINES FOR EVERY MOLDING JOB



COMPRESSION INJECTION TRANSFER

THE HYDRAULIC PRESS MFG. CO.

1010 MARION RD., MT. GILEAD, OHIO, U. S. A.

When It's Grinding or Pulverizing

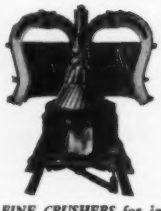
STURTEVANT EQUIPMENT

DOES THE JOB FAST!

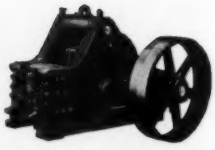
Whether you grind soft or hard materials, there is a Sturtevant Grinder or crusher exactly suited to your requirements.

Tough and rugged, Sturtevant Equipment has the built-in stamina to stand up under continuous operation. Most of this equipment has the "open door" accessibility which makes cleaning easy.

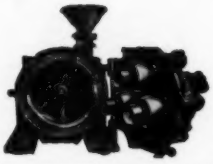
Look into Sturtevant Grinders and crushers for your applications. These machines will give you the exact mesh you want . . . cut your costs by increasing production. Write for catalog today.



ROTARY FINE CRUSHERS for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.

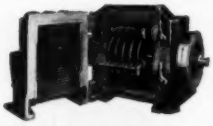


JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



RING-ROLL MILLS for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

CRUSHING ROLLS for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



SWING-SLEDGE MILLS for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

MOTO-VIBRO SCREENS screen anything screenable. Classified vibrations. Unit construction—any capacity. Open door accessibility. Open and closed models with or without feeders. Many types and sizes—range of work ⅛" to 60 mesh.

STURTEVANT MILL COMPANY

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DESIGNERS & MANUFACTURERS OF DENS AND EXCAVATORS • MIXERS • SCREENS • PULVERIZERS • ELEVATORS • AND COMPLETE FERTILIZER UNITS

Manufacturers of phenolic thermosetting molding compounds and phenolic synthetic resins for the electrical, transportation, home appliance, paper and pulp, protective coating and foundry industries.

Dry granular phenolic thermosetting molding compounds are produced in blacks, browns, mottles and colors in general purpose, heat-resisting and medium impact grades. Special purpose molding compounds are produced to fulfill special molding requirements.

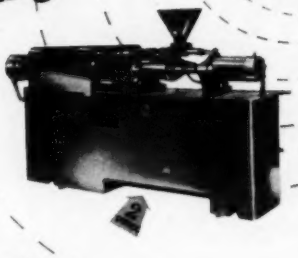
Synthetic resins are produced in dry, lump and finely ground particle size or in solution adaptable to customer's requirements. Technical service is extended and inquiries are invited.

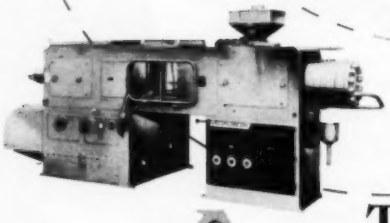
PLASTICS ENGINEERING COMPANY

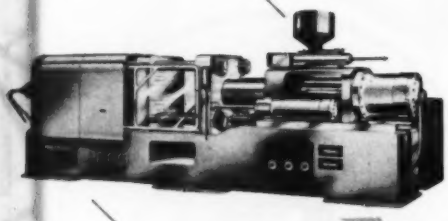
Sheboygan, Wisconsin

focus on injection moulding machines

PECO PROJECTILE PRODUCTS







THE attention of Plastics manufacturers may profitably be centred on PECO Injection Moulding Machines, for they are designed to give high productivity through maximum efficiency.

They are built in 2oz., 4oz., 8oz., and 16oz. capacities. They represent the most up-to-date development of this type of plant.

Full particulars will be sent on request.

MOULDS

PECO MOULDS. Expert designers and mould makers are employed and moulds can be supplied to samples submitted, including die-sinking models if desired. An important side of the Company's work is the hobbing of cavities for moulds and medallions—the plant includes a 3,000-ton Hobbing plant. Master Hobs to customers' samples made as required.

THE PROJECTILE & ENGINEERING COMPANY LTD.

ACRE STREET, BATTERSEA, LONDON, S.W.8, ENGLAND

Telephone: Macaulay 1212 Telegrams: "Profectus, Claproad, London". Cables: "Profectus, London".

You are cordially invited to inspect our exhibits at the Canadian International Trade Fair.

the plant's enlarged—the product improved

for users of PLIOVIC

USE PROVED Products

EVERY user of vinyl resin can gain from the triple expansion of the plant you see here—source of Goodyear's use-proved vinyl resin, PLIOVIC.

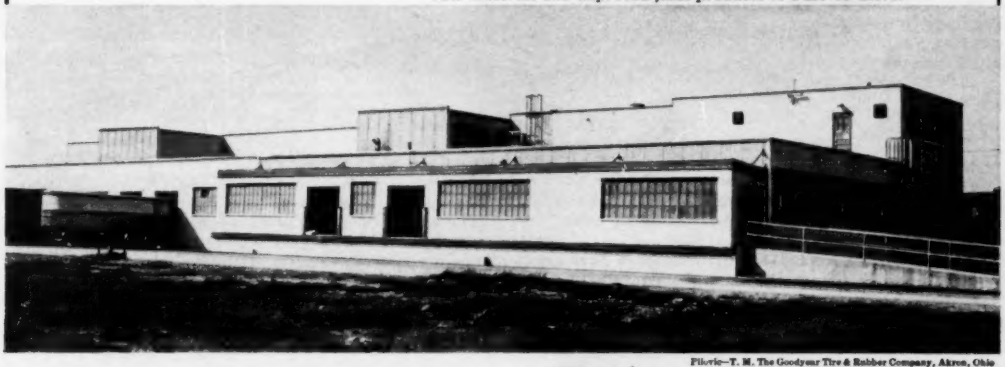
As a result of this expansion in size and improvement in equipment, you can now count on all the PLIOVIC you want—no strings attached. And PLIOVIC now gives users all these advantages: higher resin uniformity; easier processing; lower moisture content; improved thermal stability, bulking and water absorption.

If you produce molded or extruded vinyl items—use organosols, plastisols or latex dispersions—calender, spread or cast—look to PLIOVIC for help to better product quality.

Write today for sample and full information to:

Goodyear, Chemical Division
Akron 16, Ohio

This modern triply-enlarged PLIOVIC *plant assures improved raw material and improved final products to* PLIOVIC *users.*



Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

GOODYEAR

THE FINEST CHEMICALS FOR INDUSTRY

This processing setup was developed several years ago by Farrel-Birmingham engineers, working with plastics manufacturers, to synchronize the progressive steps in the production of calendered plastic film and coatings.

Since then, many installations have been made in plastics plants. In fact, the combination has been giving such satisfactory service that it has become the generally accepted unit for this type of production.

Using this setup, one manufacturer has been able to produce, for the first time on a commercial scale, 1.7 gauge, calendered, unsupported vinyl film. The variation in accuracy of gauge of the final product is less than plus or minus .0001 inch.

Farrel-Birmingham engineers will be glad to help you select individual machines or combination units best suited to your specific requirements. Send for further information.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

FB-750

Farrel-Birmingham®

Gering is Geared TO SERVE THE ENTIRE PLASTICS INDUSTRY

a complete **PLANT**

for a complete **SERVICE**

WE MANUFACTURE Virgin Thermoplastic injection and extrusion molding compounds, standard and special formulations — Polystyrene, Polyethylene, Acetate, Acrylics, Ethyl Cellulose, Vinyls.

- **WE BUY THERMOPLASTIC SCRAP** — all types and forms: Polystyrene, Vinyls, Nylon, Ethyl Cellulose, Polyethylene, Acetate, Butyrate, Acrylics.
- **WE CUSTOM COMPOUND** your materials, and offer these special services: Sorting, De-contaminating, Color-Matching, Pelletizing.
- **WE EXTRUDE** any flexible or rigid formulation which you plan, for any special-shaped Belting, Binding, Edging, Rods, Tubes, Film, Strips — in Polystyrene, Cellulose Acetate, Polyethylene, Vinyl, Butyrate, Ethyl Cellulose, Acrylics.

DRYCOL —offered as Gering's perfected dry coloring medium for in-plant coloring of ALL PLASTICS. No special skill or equipment needed. Standard, Special and Metallic colors available or to order.

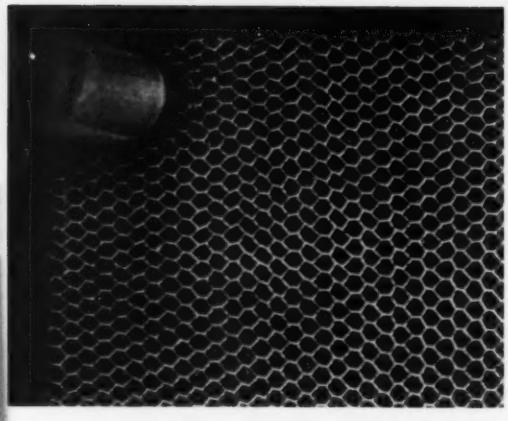
Our service is world-wid... attained over the yea... thru eternal self-disciplin... for Quality, Perfectio... Delivery. Consult o... Technical Service Depar... ment.

Our 30 years expert know-how and large facilities: Your guarantee of complete satisfaction.

GERING *Products* INC. KENILWORTH, N. J.

Do you require SANDWICH STRUCTURES with High Strength-Weight Ratios?

ALUMINUM Hexcel Honeycomb now available in 1/8" cell size!



Gives optimum skin-bond strength, meets needs of sandwich structure fabricators!

If you are dealing with sandwich structures, you will find this new Hexcel core material has extremely advantageous properties: provides substantially 100% bond area, thus increasing skin bond strength, reducing bonding costs and giving increased bond-weight efficiency. At the same time it simplifies bonding processes.

The 1/8" cell size is the newest development of California Reinforced Plastics Company, which also produces Hexcel Aluminum Honeycomb in 3/16, ¼, and ⅜" cell sizes, with densities ranging from 1.5 to 8.0 pounds per cubic foot.

All types of Aluminum Hexcel Honeycomb are now available in permeable form for use in bonding processes where it is necessary to release excessive adhesive volatiles.

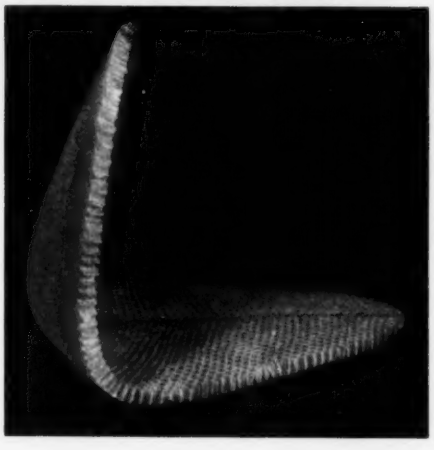
In addition to high strength-weight ratio, Hexcel Honeycomb used in sandwich structures offers advantages of high rigidity, insulation, smooth exteriors, construction with fewer parts, and relatively low-cost. It may be used effectively in manufacture of *truck panels, doors, wall paneling,* and other structures where high strength, light weight and rigidity are important factors.

Complete range of Aluminum and Glass Fabric Honeycomb Manufactured by California Reinforced Plastics Company

Hexcel Glass Fabric Honeycomb now PRE-SHAPED

One of the most important recent developments in the sandwich structure field has been the pre-shaping of Hexcel Honeycomb for use in production of radomes and other curved structures. This process, pioneered by California Reinforced Plastics Company, greatly reduces lay-up time with consequent increase in output and without additional tooling, floor space, or manpower. Anticlastic tendency is completely eliminated.

An example of PRE-SHAPED Hexcel Glass Fabric Honeycomb is this "tailor-made" unit for a small radome. A special forming material was developed in the CRPC laboratory to permit production of this sharp curvature Honeycomb lay-up in one piece. As illustrated, it is ready for application of glass fabric skin. Various shapes can be developed to meet the need of individual jobs. For example, Hexcel Honeycomb is furnished in thirteen identical pre-shaped pieces and one nose piece for each radome of North American Aviation Company's F86-D Sabrejet All-Weather Interceptor.



Do you have problems related to SANDWICH STRUCTURES? • Write California Reinforced Plastics Company, Dept. M.

California Reinforced Plastics Company

Hexcel **STRUCTURAL HONEYCOMB in ALUMINUM and GLASS FABRIC**

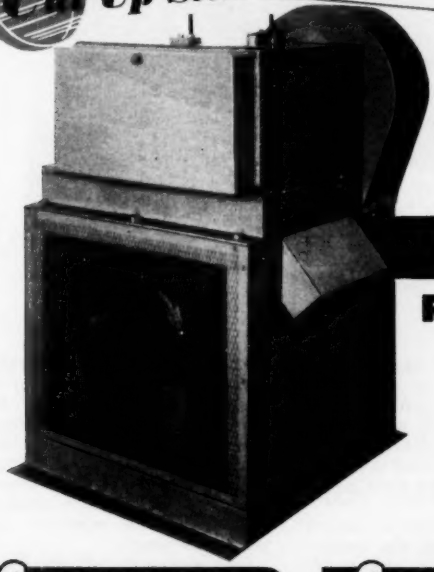
DEPT. M • 951 SIXTY-FIRST STREET AT LOWELL • OAKLAND 8, CALIFORNIA

Cut Slabs From Compounding Mills!

Produce Pellets For Molding Material!

Cut Up Continuously Extruded Scrap!

Cut Up Side Shear or Rejected Sheet Material!



DO ALL 4 and more...

WITH THE

CUMBERLAND

Rotary Chopping Machine

Every day more and more time and money saving uses are being found for this versatile machine.

Bulletin 400 gives full information. It will probably suggest a use for your plant.

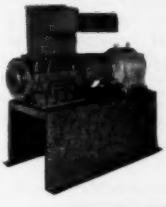
CUMBERLAND

PLASTICS GRANULATING MACHINES

Models 0, ½, 1½

Small and medium capacity. Designed specifically for plastics. Rugged and easy to clean. Request Bulletin No. 250.

CUMBERLAND



GRANULATING MACHINE

Model 18

Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin No. 250.

Now Available!

A NEW CUMBERLAND

DICING (or CUBING) MACHINE

Designed for producing small cubes from sheet plastic stock.

Write now for complete information!

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

The fault was in choosing the wrong type fastener . . . but

THE MOLDER WAS BLAMED

When "tough breaks" like this occur —and they happen too often in assembly with plastics parts—it's the custom molder, usually, who gets the blame. Yet, all too often, the fault lies *not* with the molding compound but with the fasteners used by the manufacturer.

Use of the wrong *type* of fastener may not only damage the molder's reputation unfairly . . . it can *wipe out* your profits, through parts spoilage and increased production costs. That's why so many good custom molders, interested in their customers' problems, get recommendations first from Parker-Kalon.

First, because Parker-Kalon makes a complete line of Self-tapping Screws —will fit the fastener to your special needs, *not* your needs to the fastener.

Second, because Parker-Kalon, originators of Self-tapping Screws, learned long ago how to keep hardness and toughness properly balanced in *every* screw—learned to maintain the uniform quality that keeps fast-moving assembly lines trouble-free. And there's no substitute for 35 years experience.

So question the efficiency of your fastening method before you blame your molder. Call in a P-K Assembly Engineer—preferably at the design stage. It will pay you—in fewer rejects, faster assembly, and help your molder serve you better. Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through accredited Distributors.

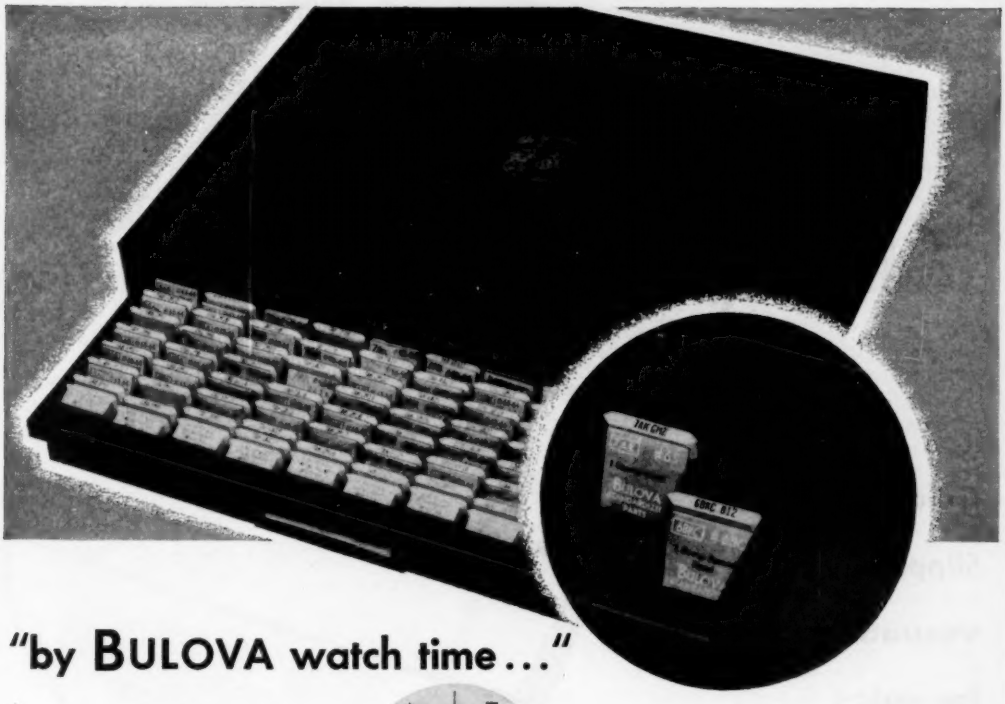
*TRADE MARKS REG. U.S. PAT. OFF.

P-K TRADE MARK

The Original

PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY



"by BULOVA watch time..."

Koppers *Polystyrene*

...for precision packaging

● With the same care and regard for precision that they use in watchmaking, Bulova has prepared this parts cabinet for their dealers.

Koppers Polystyrene 81 proved the ideal choice for this new cabinet for several reasons. It offers practical, time-saving advantages and maximum convenience in use. The dividers (also made of Koppers Polystyrene) are easily moved to accommodate changing volumes of stock, and are molded of ivory-colored Polystyrene to make identifying lettering extremely readable and provide quick identification. The handsome mahogany color of the cabinet will always be fresh and new-looking.

Of prime importance is the fact that this new cabinet represents a substantial saving in manufacture and use over a previous metal model which it replaces.

Koppers Polystyrene 81 is a lubricated plastic, well suited for precision molding of this type. Its ease of flow assures that it will fill the mold, giving sharp definition to divider slots and corners, and permitting the molding of thin wall sections. Its improved physical properties plus greater dimensional stability provide a strong, rigid, good-looking cabinet and drawer that fit together perfectly.

• • •

Write for further information about the adaptability of Koppers Polystyrene to your housing or packaging problem. Our technicians are anxious to work with you . . . to design new packages or products to be made of Koppers Polystyrene, and to help you obtain the best possible results in using this versatile plastic.

Koppers Plastics make Many Products Better and Many Better Products Possible.

KOPPERS

KOPPERS COMPANY, INC., Chemical Division, PITTSBURGH 19, PA.

SALES OFFICES: NEW YORK · BOSTON · PHILADELPHIA · CHICAGO · DETROIT · LOS ANGELES

Golden Slippers . . . vacuum-engineered for sales

Coty, Inc. hit upon a swank display idea for its famous perfumes, "Emeraude" and "L'Aimant de Coty": Why not send them to market in golden slippers?

Result? What you see in the picture—beautiful slippers made of reclaimed plastic with an untarnishing coat of aluminum that is overcoated with transparent yellow lacquer to look more golden than gold itself.

This delicate skin of shining metal was applied by Vacuum Metalizing Corporation of Long Island City, New York, using high vacuum equipment developed by DPi.

In this mass production process, vaporized aluminum condenses on the lacquer-dipped plastic moldings to form a solid metallic film only 5 millionths of an inch thick. (It takes only a few snips of aluminum wire to coat a great many slippers.) The topcoat of lacquer protects the metal film and provides the gold or other metallic color effects, if desired.

DPi's experience in high vacuum metallizing techniques and associated lacquering operations, opens an almost limitless range of profit-making possibilities for plastics molders—decorative items such as nameplates, escutcheons, costume jewelry, buttons; toys; fabrics; engineering components like electrical capacitators; and so on, almost without end.

We would welcome a chance to discuss specific vacuum metallizing applications with you. Meanwhile, for a copy of the above data sheet describing DPi coating equipment, write ***Distillation Products Industries,*** Vacuum Equipment Department, 779 Ridge Road West, Rochester 3, N. Y. (Division of Eastman Kodak Company).

DPi

high vacuum research and engineering

Also . . . vitamins A and E . . . distilled monoglycerides . . . more than 3500 Eastman Organic Chemicals for science and industry

no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

That's what one of the thousands of pleased users says about his CRUCIBLE TOOL STEEL SELECTOR, the new, simple, handy method of picking the right steel, *right* from the start. Since Crucible announced this Selector two years ago, thousands of tool steel users have received their Selectors . . . and here's what some of them say —

"Handiest selector I've ever seen!"
"Saves me time and headaches"
"It's so logical—you begin with the application".

You can be sure the answer you get with your Crucible Tool Steel Selector will be just right in every case, for this Selector covers 22 tool steels which fit 98% of all tool steel applications. And when—with a flip of the round dial—you get the answer, you'll get the steel FAST, too, because all the tool steels on the Selector are right in stock, in all our 26 conveniently-located warehouses.

This Selector is bound to be a big help to you—so write for yours today. There is no obligation whatsoever. Just fill in the coupon and mail now . . . before you turn this page and forget! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, New York.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!

Crucible Steel Company of America
Dept. MO, Chrysler Building
New York 17, N. Y.
Gentlemen:
Sure! I want my free CRUCIBLE TOOL STEEL SELECTOR!

Name_____ **Title**_____
Company_____
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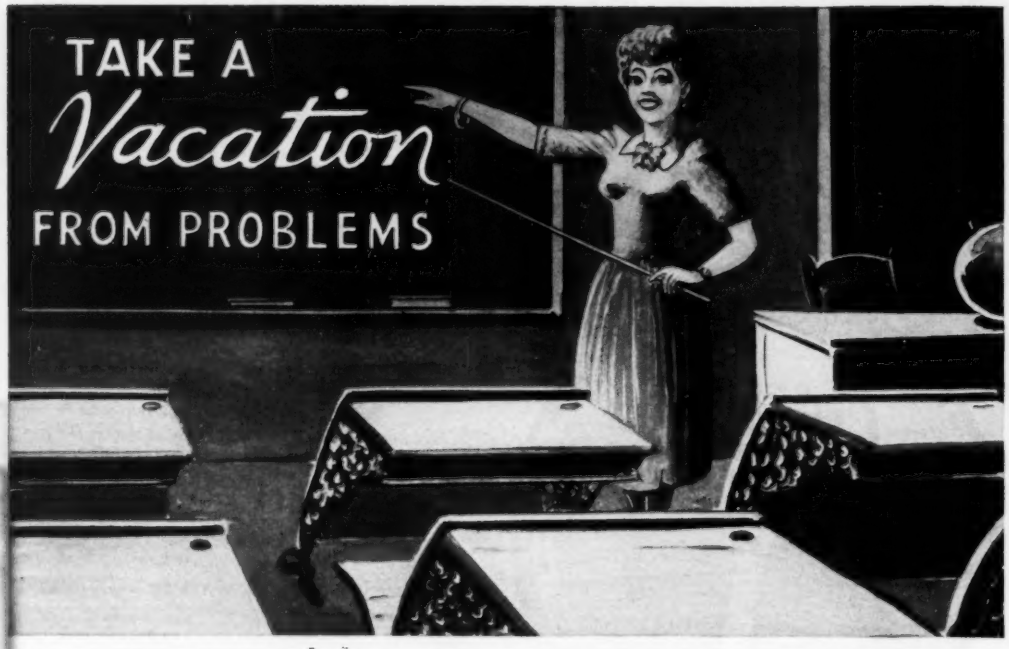
CRUCIBLE first name in special purpose steels

TOOL STEELS

52 years of Fine steelmaking

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.



Use HARCHEM Plasticizers and have no problems because:

HARFLEX® PLASTICIZERS
ARE OUTSTANDING FOR

Low Temperature Performance

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For Plasticizers of QUALITY, write

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THE KEY TO HARCHEM® BETTER PLASTICS

Manufacturers of Sebacic Acid

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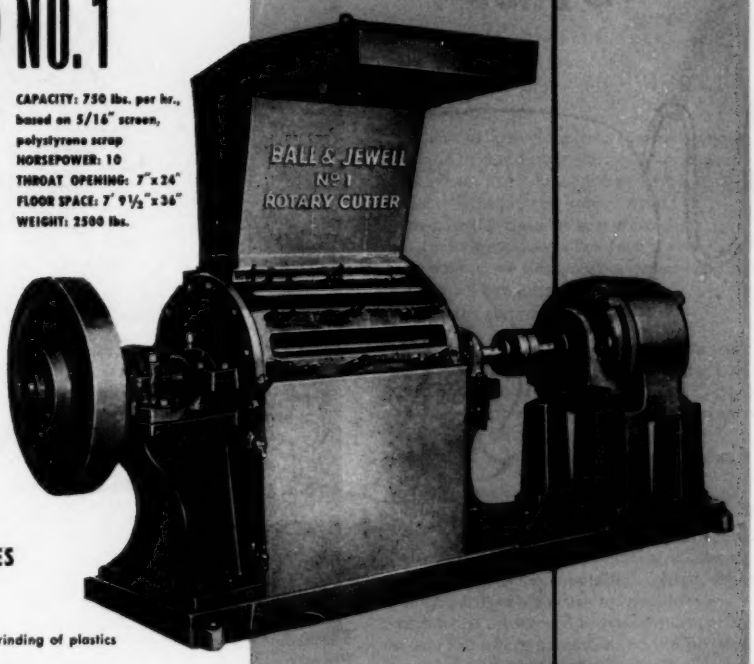
NO. 1

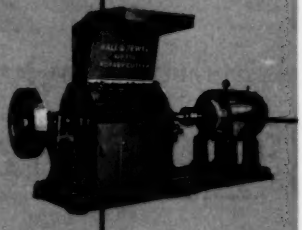
CAPACITY: 750 lbs. per hr., based on 5/16" screen, polystyrene scrap
HORSEPOWER: 10
THROAT OPENING: 7"x24"
FLOOR SPACE: 7' 9½"x36"
WEIGHT: 2500 lbs.



SPECIAL DESIGN ADVANTAGES

- For high production grinding of plastics molding scrap
- Low Cost — Medium Duty
- Re-Designed and improved again in 1951 (first model built in 1895).

Require A Smaller Machine? Ball & Jewell No. ½ T.D.
Throat openings of 5½"x 20" or 8"x 30". Horsepower, 7½. Capacity, 900 lbs. per hr.



Require A Larger Machine? Ball & Jewell No. 1½
Capacity rating, 1500 lbs. an hr. with 20 horsepower motor. Throat opening of 20"x 8".

Your grinder source for every individual plastic material cutting requirement and capacity (50 to 3,000 lbs. per hr.)—Ball & Jewell, machine tool builders since 1865, have always paced the grinding needs of the plastics industry. Send us your requirement specifications.

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NOBODY GETS FIRST PRIZE IN THIS SHOW

There is no "Best of Show" Blue Ribbon in the Plastics Parade. Every entry is a specialist, suited for specific jobs.

It's up to your custom molder, guided by his experience, and what you tell him, to help you select the best plastic material for your molding job.

We've been putting buyers of molded plastics on the right track for over thirty years. As molders of almost all plastics by almost all methods we hold no brief for any of them, only for the satisfactory performance of your product.

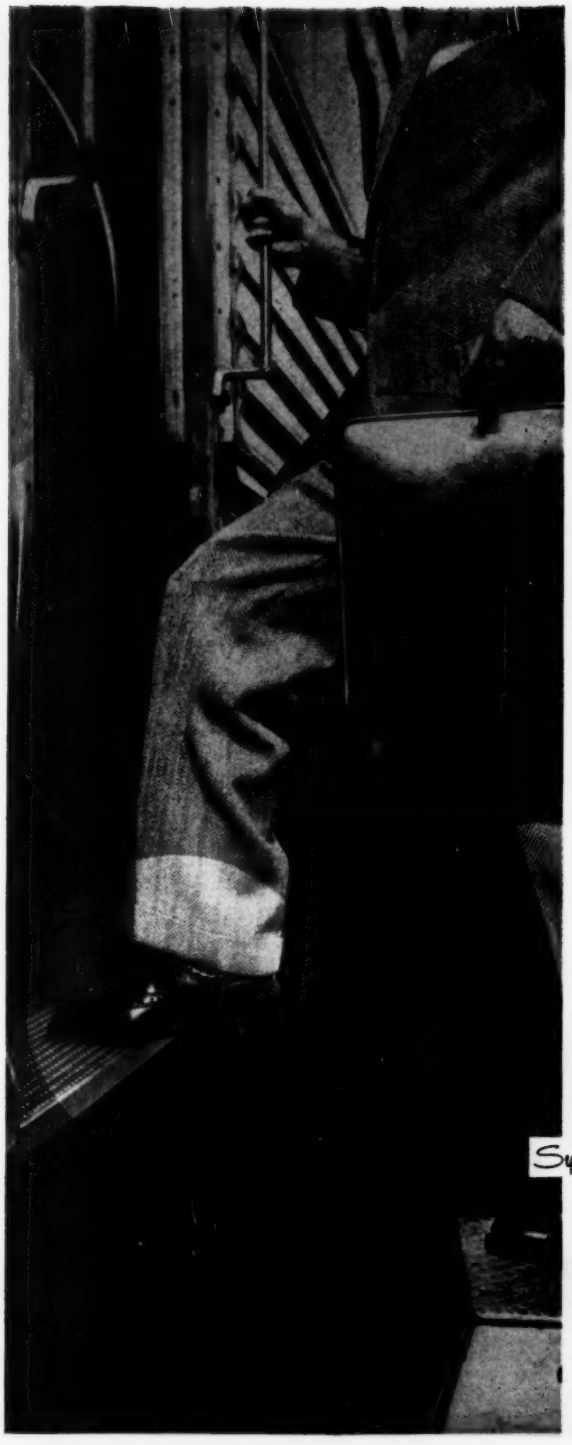
Check with us when it comes to deciding which plastic to use.

You'll get the friendly, cooperative service that's made the name Boonton a favorite by-word among users of custom molding.

BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, MURRAY HILL 6-8540



APPOINTMENT WITH TIME

When you travel by train (or, for that matter, by plane or any public carrier) you expect to arrive on time. Unconcerned, you click-click across switches in the yard district . . . swish past the clang of grade crossings . . . roar by freights only a few inches away . . . Your confidence lies in experienced railroaders and properly maintained roadbeds and signal equipment.

Over every mile of track, your safe and speedy progress is guarded. Guarded by semaphores, position and color light signals, dwarf signals, automatic train controls, interlocking control machines in far-away towers, and other elements in an all-inclusive safety pattern.

An *unseen essential* in this safety pattern, reliable and hard-working, is *Synthane*. Synthane is a strong, light-weight, laminated plastic. It's an excellent electrical insulator, moisture and chemical-resistant, hard, tough and dense. It is also easy to machine. Synthane is a material for small parts or large on any job where a combination of properties is needed and good performance is a "must".

Maybe you can use Synthane profitably. To find out, send for the complete Synthane catalog. We will be glad to help you with design, sheets, rods, tubes or fabricated parts. Synthane Corporation, 8 River Road, Oaks, Pennsylvania.

Terminal Board (left) for continuous train control and relay pusher (right). Both pieces are made from Synthane laminated plastics for General Railway Signal Co., Rochester, N. Y.

Synthane-one of industry's unseen essentials

SYNTHANE

LAMINATED PLASTICS

Close Tolerances In Large Molded REFRIGERATOR PARTS

ALL MOLDED FINISHED AND ASSEMBLED BY Santay

When the Admiral Corporation wants precision molding of large parts and a product completely finished and assembled . . . they choose Santay.
Close tolerances are essential on the Baffle, Freezer Drawer and Air Control of this refrigerator. Any variation in size would keep the parts from fitting properly into the unit. All metal and plastic parts are completely assembled at Santay . . . ready for immediate installation with a perfect fit by Admiral.
This is just one example of how Santay serves industry with quality, quantity and economy. Why don't you let a Santay engineer analyze your plastic and metal requirements? Phone or write today.

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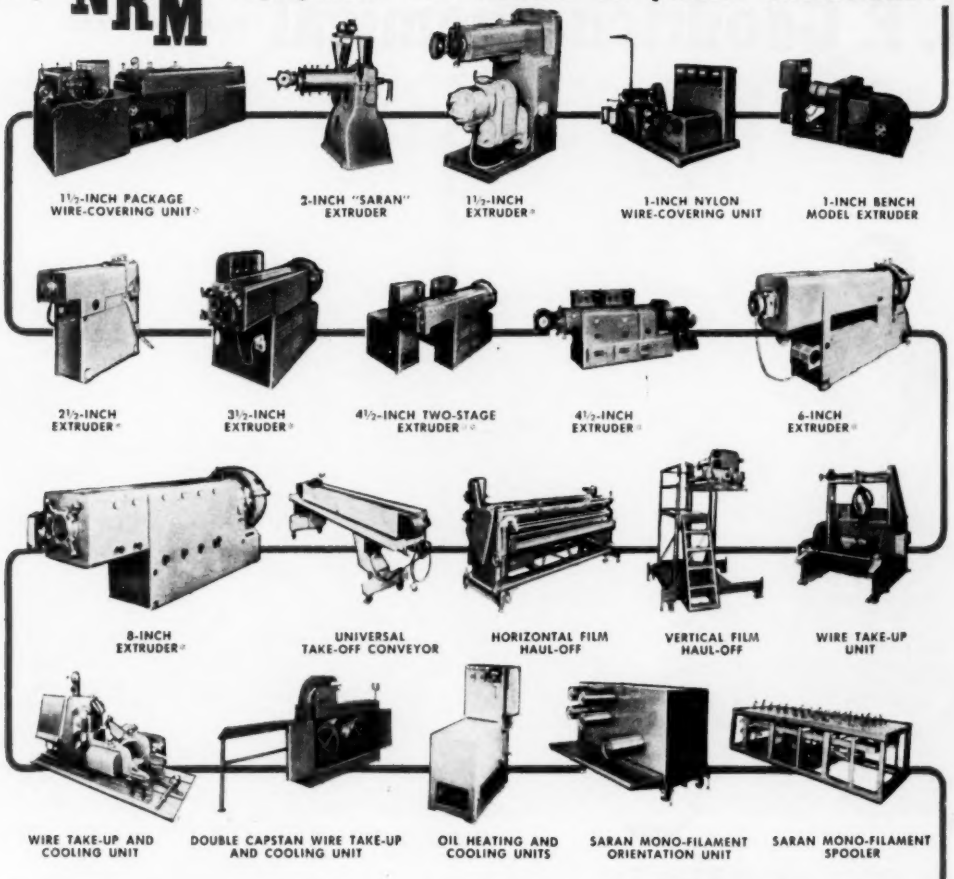
only NRM equipment can handle all plastic extrusions . . .



Here's a line of extrusion equipment that's specifically designed for the processing of plastics. It's a line that's engineered to answer all your extrusion problems — to give you better extrusions at lower costs — to give you long, trouble-free service.

The NRM line is the most complete in the field. It's backed by almost 25 years' experience in the manufacture of processing equipment. It's supported by a large staff of engineers and complete laboratory facilities.

Let NRM's engineers show you what the right equipment can do with any extrudable plastic — submit your extrusion problem, today!

*Available with oil or electric heating

**Available also in 3½", 4½", 6" and 8" sizes

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West: S. M. Kipp, Box 441, Pasadena 18, Cal.

Export: Omni Products Corporation, 460 Fourth Ave., New York 16, N. Y.

Another development using

B. F. Goodrich Chemical *raw materials*

Hycar-phenolic molding compound supplied by General Electric Company, Chemical Division, Pittsfield, Mass. Plug-in ballast molded by Plastic Products, Inc., Norwalk, Conn. B. F. Goodrich Chemical Co. supplies the Hycar American rubber only.

little plugs "take" big bumps WITH HYCAR!

THIS wall plug for a fluorescent lighting unit shows again how a Hycar-phenolic compound helped solve costly breakage problems. Formerly plugs like these couldn't stand many shocks. Breakage occurred when they took bumps from vacuum cleaners and other heavy objects—or from rough handling in assembly.

Because the design couldn't be changed, a tougher molding material had to be used. And the plug manufacturer found exactly what was needed in a Hycar-phenolic compound. It greatly strengthens the plugs. Now they come off the assembly line with minimum rejects—have far greater resistance to bumps from cleaners.

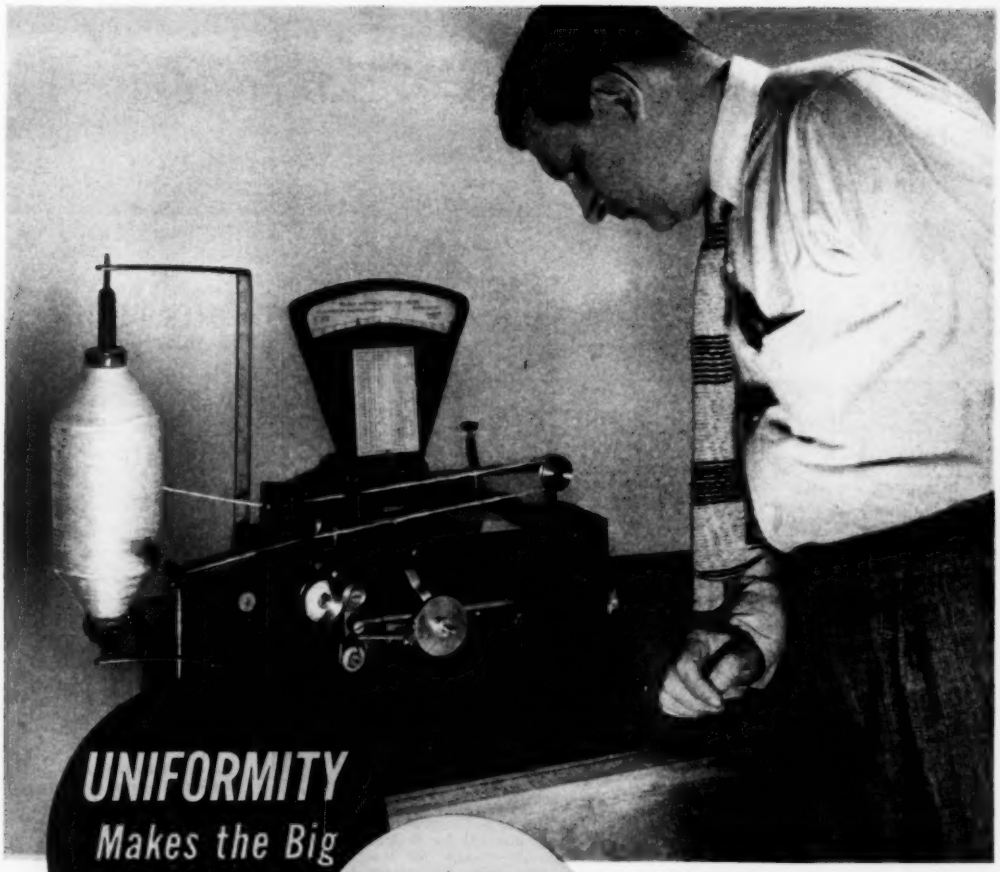
Hycar-phenolic compounds have many advantages. They impart extra toughness and shock-resistance that enable molded parts to withstand more than usual abuse. In processing, they provide better molding characteristics... easier flow in the mold than straight phenolics . . . resistance to cracking around metal inserts in the part.

One of the many Hycar rubber compounds may help you improve a product or develop new ones. For versatile Hycar is used as a base material . . . as a modifier for phenolic resins . . . as a plasticizer for polyvinyl resins . . . as an adhesive base . . . as a latex for coating or impregnating. For helpful technical advice, please write Dept. HU-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

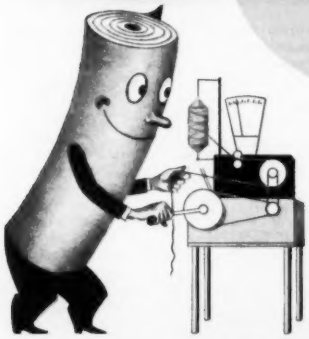
B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U. S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON organic colors



UNIFORMITY
Makes the Big Difference
In LAMINATION Fabrics



MT. VERNON EXTRA Gives You Greater Fabric Uniformity

Shown is one of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products. Here coefficient of variation and average factors of quality on evenness in roving is being checked with Belger Tester.

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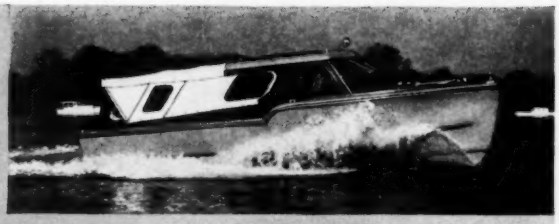
From Sleek Boat Hulls To Tubs For Automatic Washers



Pittsburgh Selectron POLYESTER RESINS

Now Ready For A Thousand New Uses

THE growing acceptance of Pittsburgh SELECTRON Resins for civilian and military production is not surprising. These remarkable reinforcing polyesters have enhanced appearance, improved utility and reduced manufacturing costs on a wide range of products from boat hulls to tubs for automatic washers.

● **The Winner Manufacturing Company,** of Trenton, N. J., uses SELECTRON in molding entire boat hulls. There are no seams or joints to open under vibration, shock or weather, or to require seasonal conditioning. The Apex Electrical Manufacturing Company, of Cleveland, Ohio, uses these resins to build two-piece baskets for its Wash-A-Matic that are lighter in weight, give better service and cost less than earlier 32-piece metal assemblies.

● **SELECTRON Resins** are thermo-setting polyesters which are available in consistency from a thin syrup to extremely high viscosity. They polymerize to form solids, with or without heat and with or without pressure.

● **When combined** with such fillers as Fiberglass, cotton, rayon, nylon, felt, sisal, paper, etc., SELECTRON Resins provide a new kind of material that is lighter than aluminum, yet—weight for weight—is stronger than steel. This material has great impact resistance and withstands the deteriorating influence of weather, sunlight, heat, abrasion and many chemicals. It can be molded in durable colors.

● **Parts in which** SELECTRON Resins are used can be molded either by hand lay-up, direct molding, continuous lamination or pre-forming. These resins can also be used without fillers for casting, potting and impregnating.

● **More and more** manufacturers are turning to SELECTRON Resins to make their products better looking, stronger and more durable. Why not call on us for advisory service? We'll be glad to have one of our engineers discuss your problems with you without cost or obligation. Such a visit may point the way to important production economies and added sales appeal.

Send for FREE Booklet

Write, wire or phone today for our new booklet containing description of SELECTRON Polyester Resins and explaining many of the ways in which they can be used. Pittsburgh Plate Glass Company, SELECTRON Products Division, 2000 Grant Building, Pittsburgh 19, Pa.

Just a few products in which Pittsburgh SELECTRON Resins are now used—

Aircraft structural parts
Radomes for electronic equipment
Life floats
Ballistic panels
Helmets
Boat hulls
Machinery housing and guards
Trays
Tote boxes
Food lockers
Garbage pails
Baskets for automatic dishwashers
Baskets for automatic washers
Wash tubs
Tool chests
Shipping containers
Instrument cases
Laundry hampers
Kitchen containers
Fishing rods
Sinks
Street signs
Traffic signs
Fluorescent light fixtures
Television cabinets
Loudspeaker housings
Gas meter housings
Structural panels for offices and homes
Door and transom lights
Awnings and canopies
Greenhouse panels
Skylighting
Molded chairs
Prefabricated houses and garages
Truck bodies

PITTSBURGH Selectron PG

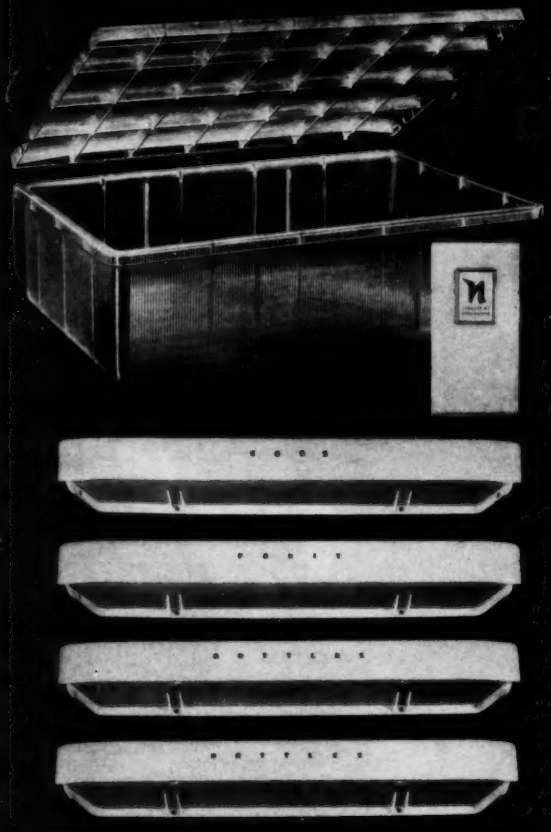
PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

Inside and Outside

Norge Uses Custom Injection Molded Plastics

by ERIE RESISTOR



Seven separate plastic parts, molded by ERIE RESISTOR, go into every popular Norge DSD 86 Refrigerator: the big Quick Chill Tray and lid; four trim Handidor shelves; and the eye-catching panel for the door release, in metallic blue on white.

For efficient storage and sparkling identification . . . Erie Resistor gives Norge a single source for all its custom molded plastic requirements. It is a single source with multiple facilities . . . a battery of 23 presses that range from 2 to 60 ounces.

The pieces for the Norge Refrigerator reflect that versatility. The ample Quick Chill Tray measures 21" by 14¾" by 6½", and lid and tray are ribbed for reinforcement. Each of the four Handidor shelves is a complete unit in one piece, and measures 19¾" long by 2¾" deep. The handsome three dimensional plastic panel in the door release weighs only 2¾ ounces.

Erie Resistor combines complete and up-to-the-minute equipment with experienced and up-to-the-minute know-how. Whether the important thing is dimensional accuracy, crystal clear flawless transparency, freedom from warpage, or startling beauty in three dimensional nameplates . . . it pays to consult Erie Resistor.

NEW PHENOLIC *with minimum impact strength of 1.05* that can be automatically preformed*

**1.05 ft. (min.) lbs./in. of notch*

Here at last is a high impact phenolic molding compound that is almost as easy to preform and mold as general purpose materials. This new material, like other Rogers impact phenolics, is formulated specifically to facilitate high speed production of high strength molded parts.

Preforms can be made on standard tabletting machines and the "pills" are not only hard but can be held to close weight tolerances. This ready preformability of RX 431 permits electronic preheating when desired for improving electrical characteristics and shortening molding cycles.

Clean and dustless, this new material is pleasant as well as easy for personnel to handle. Its molded appearance rates as good.

Complete specifications for RX 431 are available on request. Please write Dept. P, Rogers Corporation, Manchester, Conn.

Better Parts for Better Products

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CORPORATION
Established in 1832

ELMES HYDROLAIRS®

Battery of 50-Ton Elmes Hydrolairs at Yonkers plant of Otis Elevator Company.

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50-TON FLOOR MODEL
This press can be equipped for semi-automatic pushbutton operation as illustrated.

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You start saving at first cost, as Hydrolairs have no pumps, no motors. They take their power *entirely from the shop air line.* Absence of motors and pumps means less weight, less maintenance. Yet with full hydraulic operation, Hydrolairs give a continuous high pressure stroke at predetermined ram pressure. The pressure you select is applied and automatically maintained for the desired time interval—even on compressible materials. Anyone can operate a Hydrolair!

Air requirements are negligible. There's no worry about foundation or floor loads. Hydrolairs are easy to install and move. For long runs or short, these simple, durable presses are ideal for every molding job within their size and capacity range. Made in 30 ton bench model and 30 and 50 ton floor models. Your Elmes Distributor can give you full details, or write for your free copy of Bulletin No. 1036-A. There is no obligation.

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CUSTOMERS have reason to choose NORTON

THE PERFORATED gummed tape which covers the joints between adjacent sections of gypsum wallboard must be smoothed out and pressed down in order to adhere properly. To assist installers in doing the job efficiently, National Gypsum Company has followed the practice of furnishing a handy plastering paddle to each wallboard purchaser. This broad paddle, molded of the proper grade of Tenite, has a true edge and the proper degree of "flex."

Norton began molding these paddles for National Gypsum during the early 1940's. Even after metals became more available again, for reasons of low cost, they decided to have Norton continue molding them of plastic.

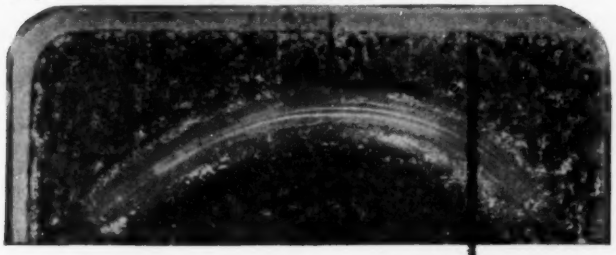
This decision was based on their satisfaction with Norton's flawless molding, sensible pricing, on-time deliveries, sound engineering and all-around cooperative service. These important factors have converted many other users of custom injection and compression molding to steady Norton customers.

Norton is interested in cultivating your molding business, too. Ask for a free survey of your next molding assignment by a Norton engineer from our nearest sales office. Norton Laboratories, Inc., Lockport, New York. Sales Offices: *New York—175 Fifth Avenue; Chicago—5221 Kimbark Avenue.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

Vinyl tubing without Milmer 1 is damaged by mildew.



Vinyls, with MILMER 1, resist mildew

Vinyl tubing with Milmer 1 resists fungi attack.

Vinyl tubing, vinyl insulation, vinyl fabric coatings and vinyl film, containing Monsanto Milmer 1, resist attack by fungi . . . look better . . . last longer than unprotected vinyls.

Fungi attacking vinyls sometimes can be seen, as in mildew, but are often invisible—causing serious damage as they eat away the plasticizers. Fungi cause vinyl products to lose their flexibility. The resultant cracking soon renders the product useless.

By following methods developed by Monsanto Research, it is easy to incorporate Milmer 1 in vinyl coating formulations, whether calendered, plastisol, organosol or solvent. Properly applied, Milmer 1 (copper 8-quinolinolate) will not cause crocking, bleeding or blooming. It does not cause trouble on calender rolls. It is *nontoxic* and *permanent*.

If you want complete information on the application of Milmer 1 to protect vinyls against fungi, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

Milmer: Reg. U. S. Pat. Off.

MILMER 1

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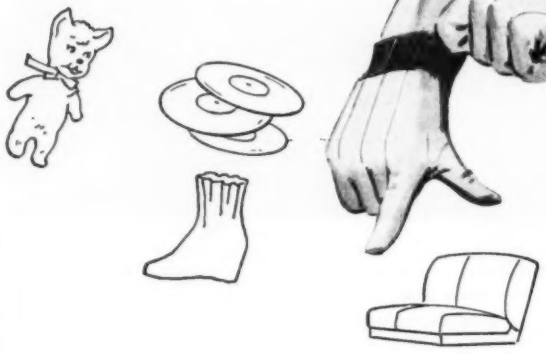
They last twice as long... vinyl products stabilized with "Dutch Boy" DYPHOS



Two thousand hours *plus* in the Weatherometer without failure . . . that's the record of "Dutch Boy" Dyphos stabilized vinyl compounds.

In plastisols, as well as organosols and emulsion dispersions, Dyphos gives you opaque vinyl products—unequalled in light- and heat-stability—excellent in color retention and long-lasting flexibility.

Dyphos gives you these advantages in vinyl moldings and extrusions, too.

Recommended also for systems using chloro-paraffins as secondary plasticizers, Dyphos is a general purpose stabilizer. You can rely on Dyphos to give your vinyl compounds the qualities needed for standout performance in service.

Let us show you how "Dutch Boy" Dyphos can simplify your operations...double the life of your vinyl formulations. Also investigate the other "Dutch Boy" chemicals. Just write for factual data and technical assistance.

"Dutch Boy" Stabilizers

PRODUCT	USE
TRIBASE (Tribasic Lead Sulphate)	Electrical and other compounds requiring high heat-stability
TRIBASE E (Basic Lead Silicate Sulphate Complex)	Low volume cost insulation
DS-207 (Dibasic Lead Stearate)	Stabilizer-lubricant for sheeting, film, extrusion and molded compounds
PLUMB-O-SIL A (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored sheeting and upholstery stocks
PLUMB-O-SIL B (Co-precipitate of Lead Orthosilicate and Silica Gel)	Translucent and colored film, sheeting, belting
PLUMB-O-SIL C (Co-precipitate of Lead Orthosilicate and Silica Gel)	Highly translucent film and sheeting
DYTHAL (Di-basic Lead Phthalate)	General purpose stabilizer for heat and light. Good electrical properties
DYPHOS (Di-basic Lead Phosphite)	Outstanding for heat and light in all opaque stocks, including plastisols and organosols
NORMASAL (Normal Lead Salicylate)	As stabilizer or co-stabilizer in vinyl flooring and other compounds requiring good light-stability
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Dutch Boy* CHEMICALS

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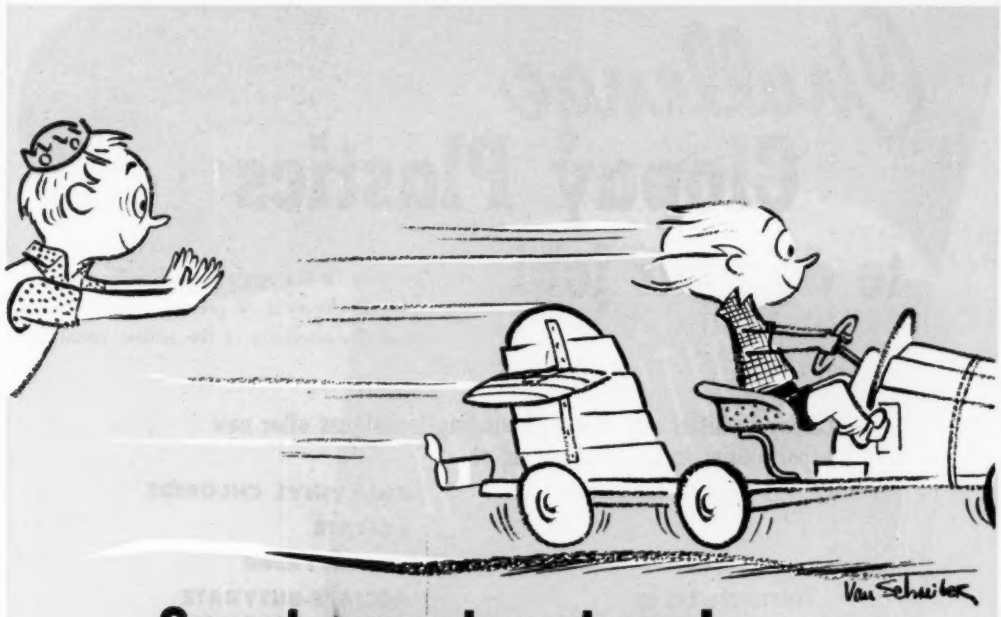
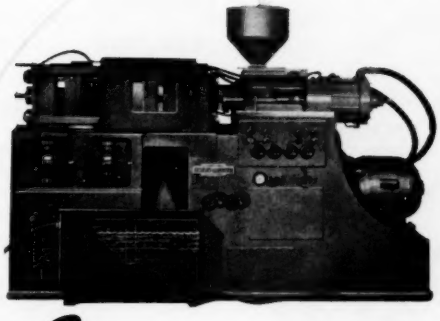


Smart operators travel in fast company

Smart operators know that extra speed means extra money when it comes to plastics molding. That's why they choose the Fellows 10-shot-a-minute 3 oz. molding machine. It is so fast that single-cavity-mold production on the Fellows 1B-3-15 is comparable to multiple-cavity-mold production on larger equipment. What's more, your sprue and runner salvage cost is cut to a minimum too.

Proven by use to be way ahead in cycling speed, automatic operation, and over-all machine economy, the Fellows 1B-3-15 rates your investigation. Write, wire or phone today!



Fellows

injection molding equipment

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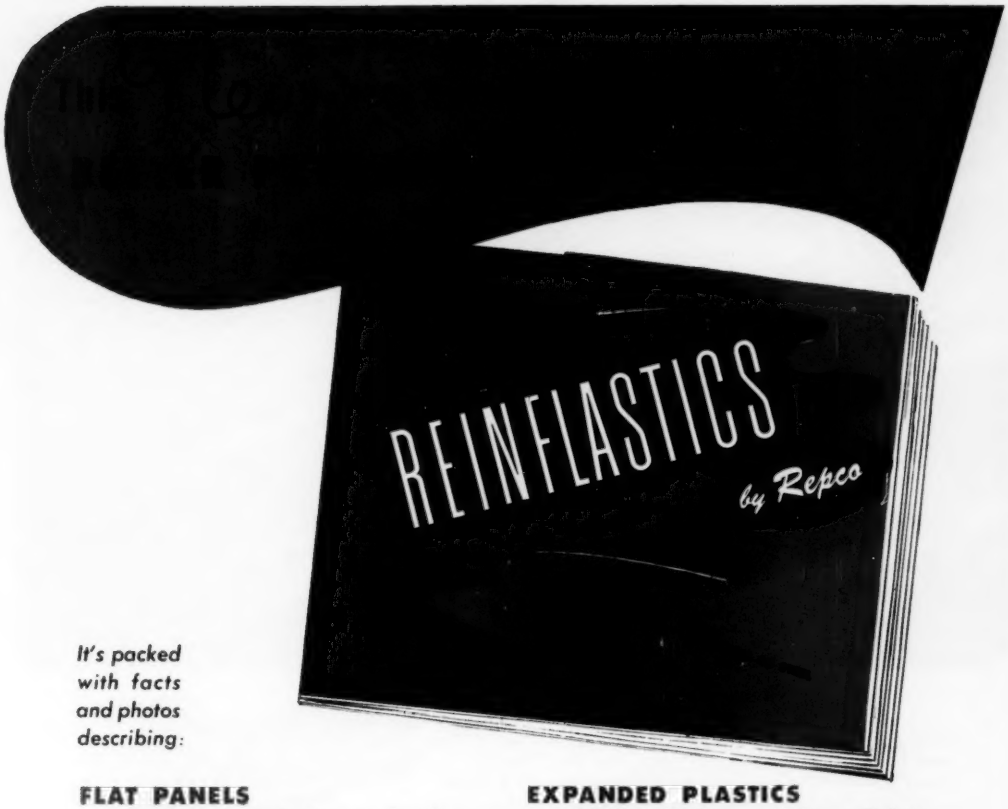

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at OWENS BRUSH

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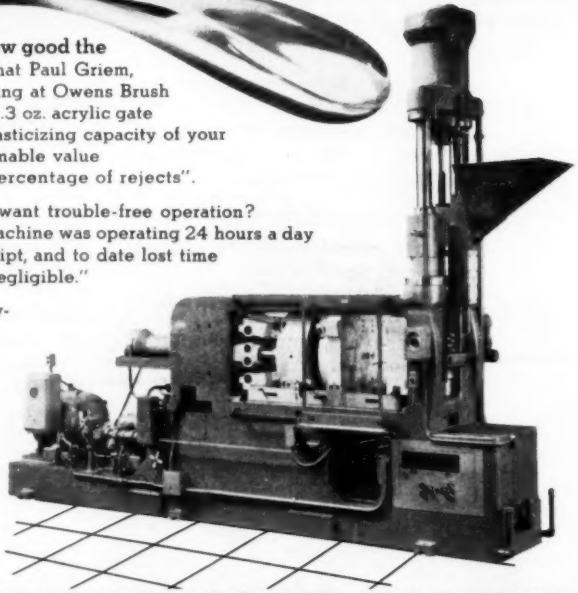

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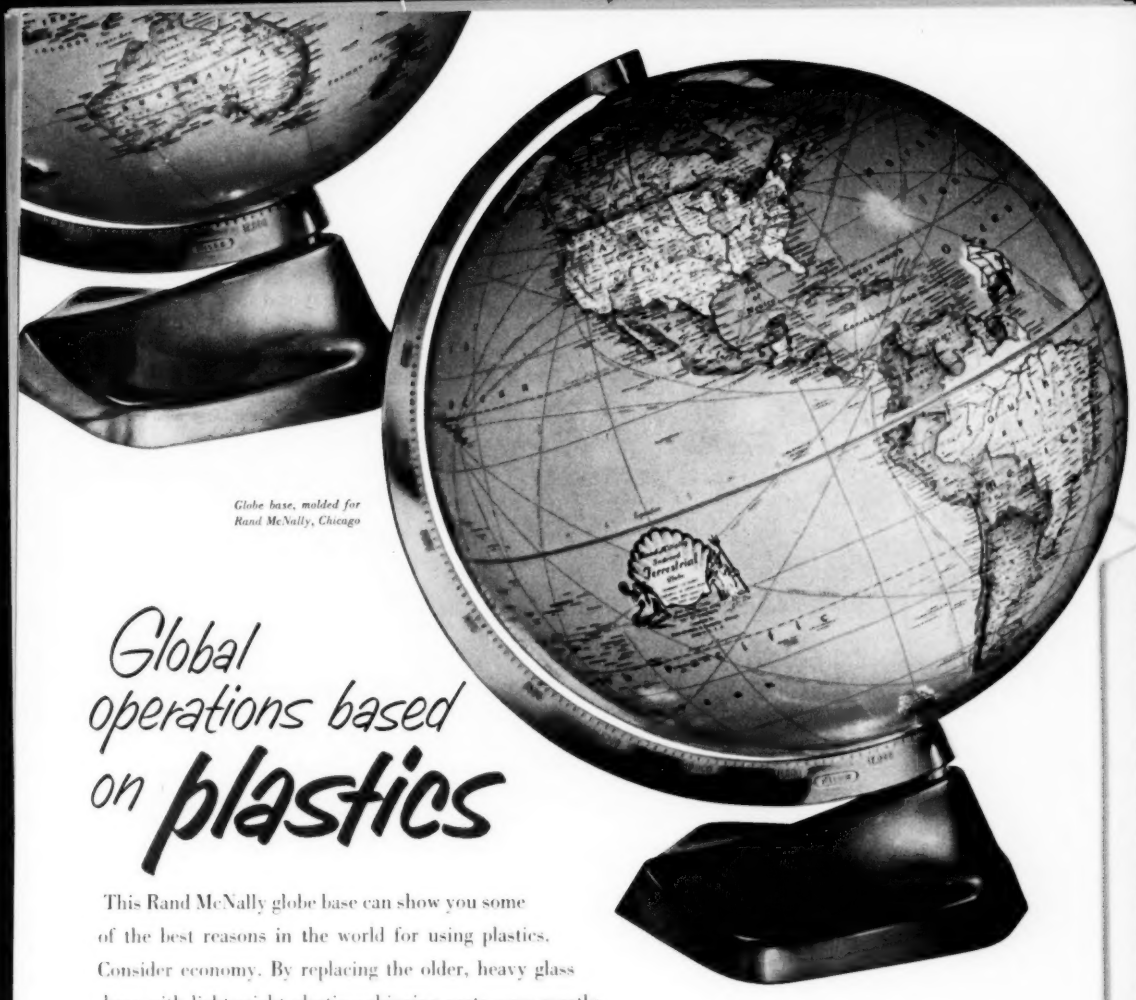

Globe base, molded for Rand McNally, Chicago

Global operations based on plastics

This Rand McNally globe base can show you some of the best reasons in the world for using plastics. Consider economy. By replacing the older, heavy glass base with lightweight plastic—shipping costs were greatly reduced without sacrificing durability. Think of appearance. Only correct design and careful molding could produce a piece with such a handsome metallic sheen without going to the great expense of painting and finishing required in other production methods.

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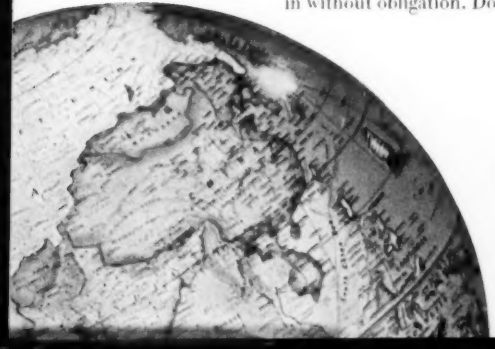
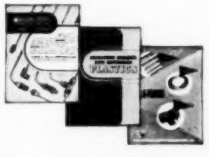
Honest counselling—proper design, skillful molding enabled us to give Rand McNally a better product at actually lower cost. We would like to do the same for your product. Feel free to call us in without obligation. Doing it today may profit you tomorrow.



Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about [redacted], piping, tubing and fittings, write for circulars containing data and illustrations.*

*Trade Mark Reg.



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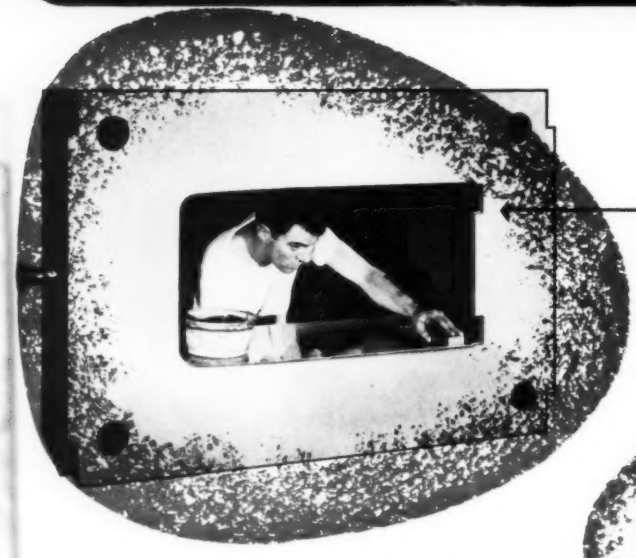

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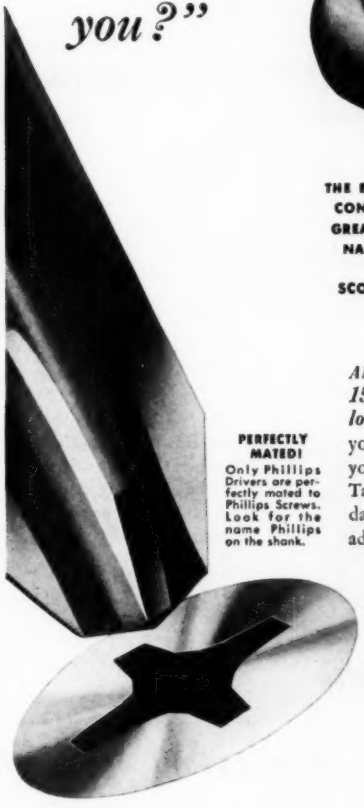

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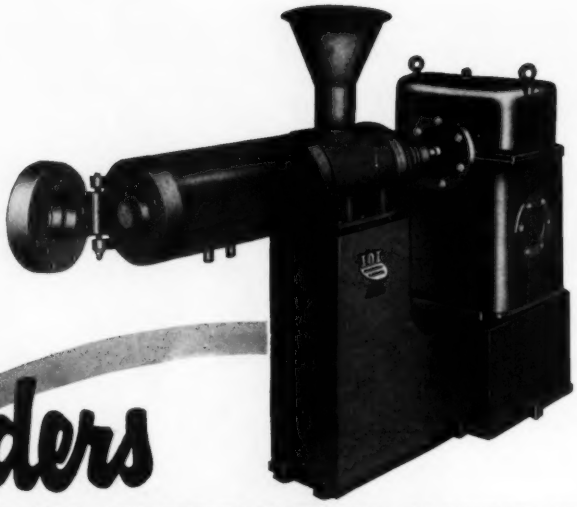

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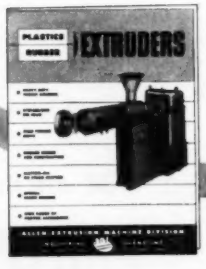

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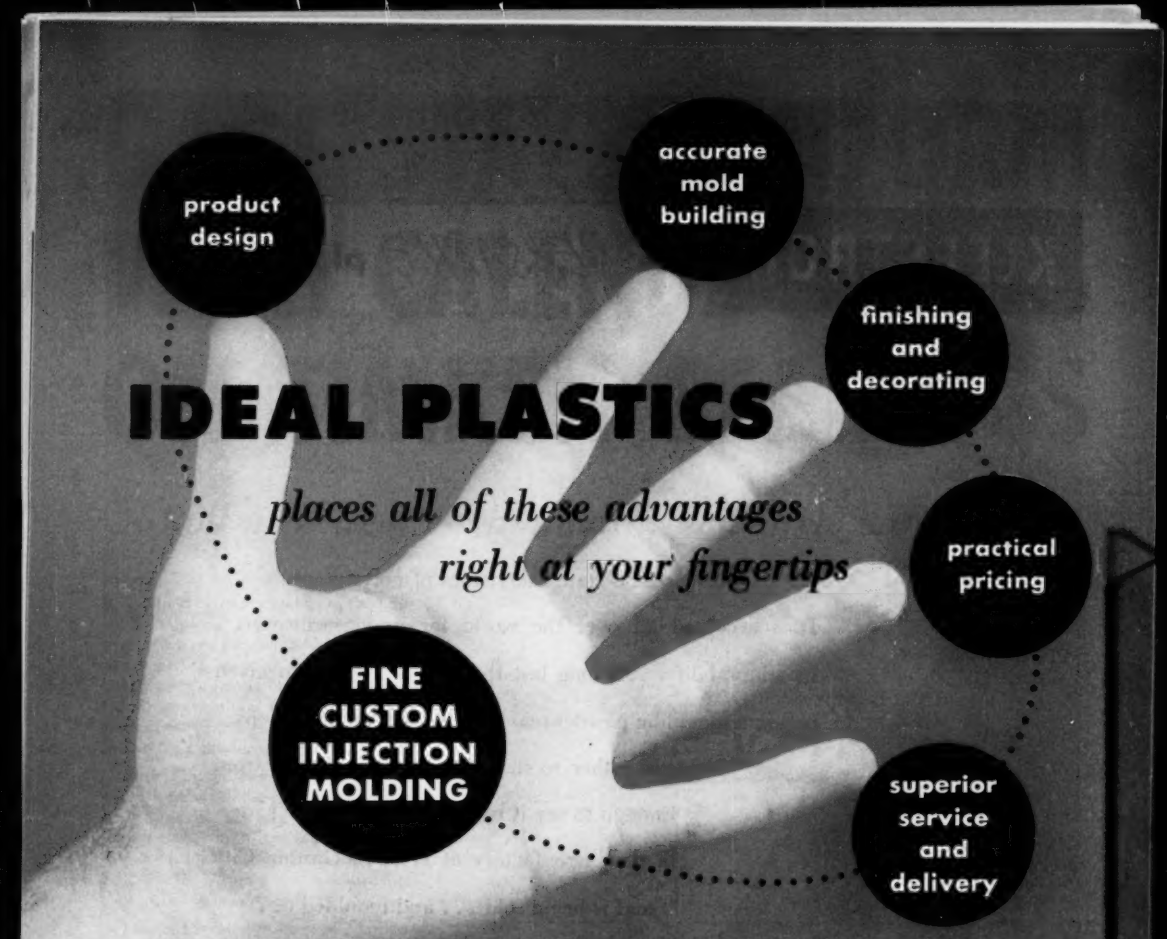

IF THERE ARE STILL decisions to be made about the design of your products, if your molds have yet to be machined, if time and costs are important to you, Ideal Plastics is the right place to bring your injection molding assignments.

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WITH calender rolls mounted on Timken® tapered roller bearings, the gage of plastic film and rubber sheeting *stays* uniform. Timken bearings keep rolls in accurate alignment longer than is possible with sleeve type bearings. Uniform gage is maintained the length of the sheet.

With Timken bearings there is no friction between the roll neck and the bearing. Roll neck wear is eliminated. As a result, calenders maintain precision with fewer overhauls. And since roll necks require no machining, downtime is minimized.

The true rolling motion of Timken bearings and smooth surface finish of their rollers and races virtually eliminate friction. Wear within the bearing is negligible, calender roll precision is maintained for longer periods of time.

Timken bearings enable calenders to hold gage to minimum tolerances. Yield is increased—you get more yards of film per pound of raw material.

The tapered construction of Timken bearings enables them to take radial and thrust loads in any combination. And line contact between rollers and races gives Timken bearings load-carrying capacity to spare.

Get the advantages of Timken bearings in your calenders, mills, refiners and mixers. For full information, write The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

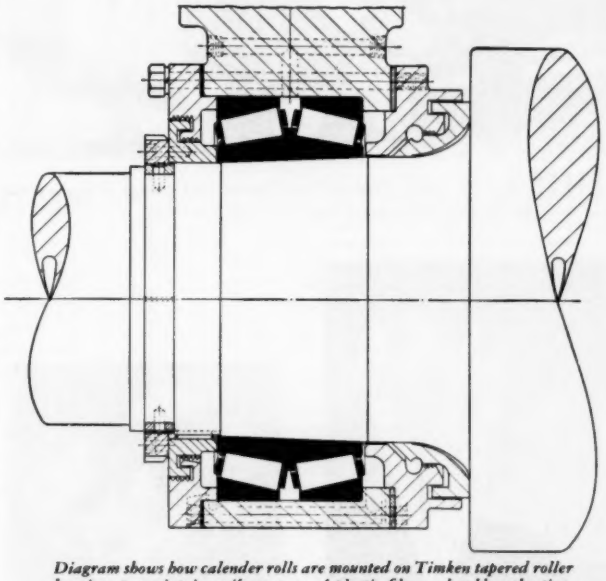

Diagram shows how calender rolls are mounted on Timken tapered roller bearings to maintain uniform gage of plastic film and rubber sheeting.

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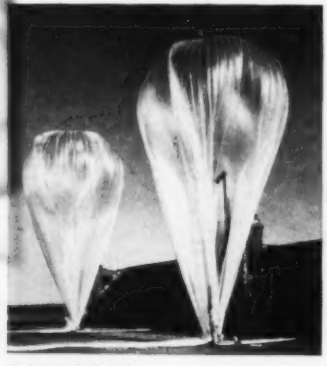
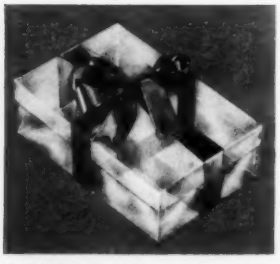


BALLOONS High flying weather balloons use specially made Plaxpak polyethylene film—another Plax research triumph to meet exceptional product requirements.



BOXES These can be formed of Polyflex sheet without adhesives or heat sealing. This oriented polystyrene sheet is brilliantly clear, low in cost. It's another unique Plax product.

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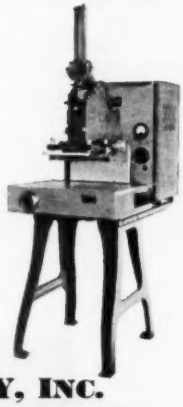

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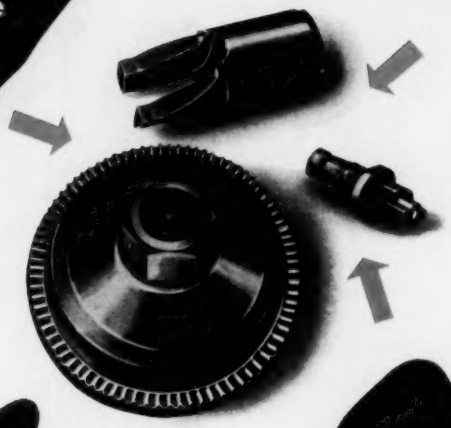

Phenolic? Glass-filled [illegible] Rubber-filled nylon? Plaskon Urea? Metal [illegible] Plated? The [illegible] are typical of various, low-cost plastics made by P R P for automotive manufacturers. The smaller piece, a silver-tipped brass insert made [illegible] tolerance, demonstrates P R P ingenuity in production.

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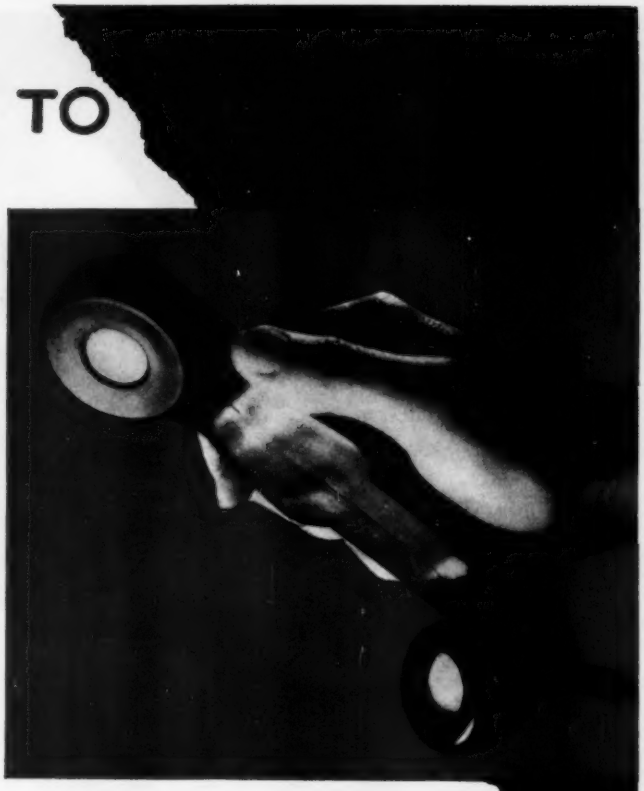

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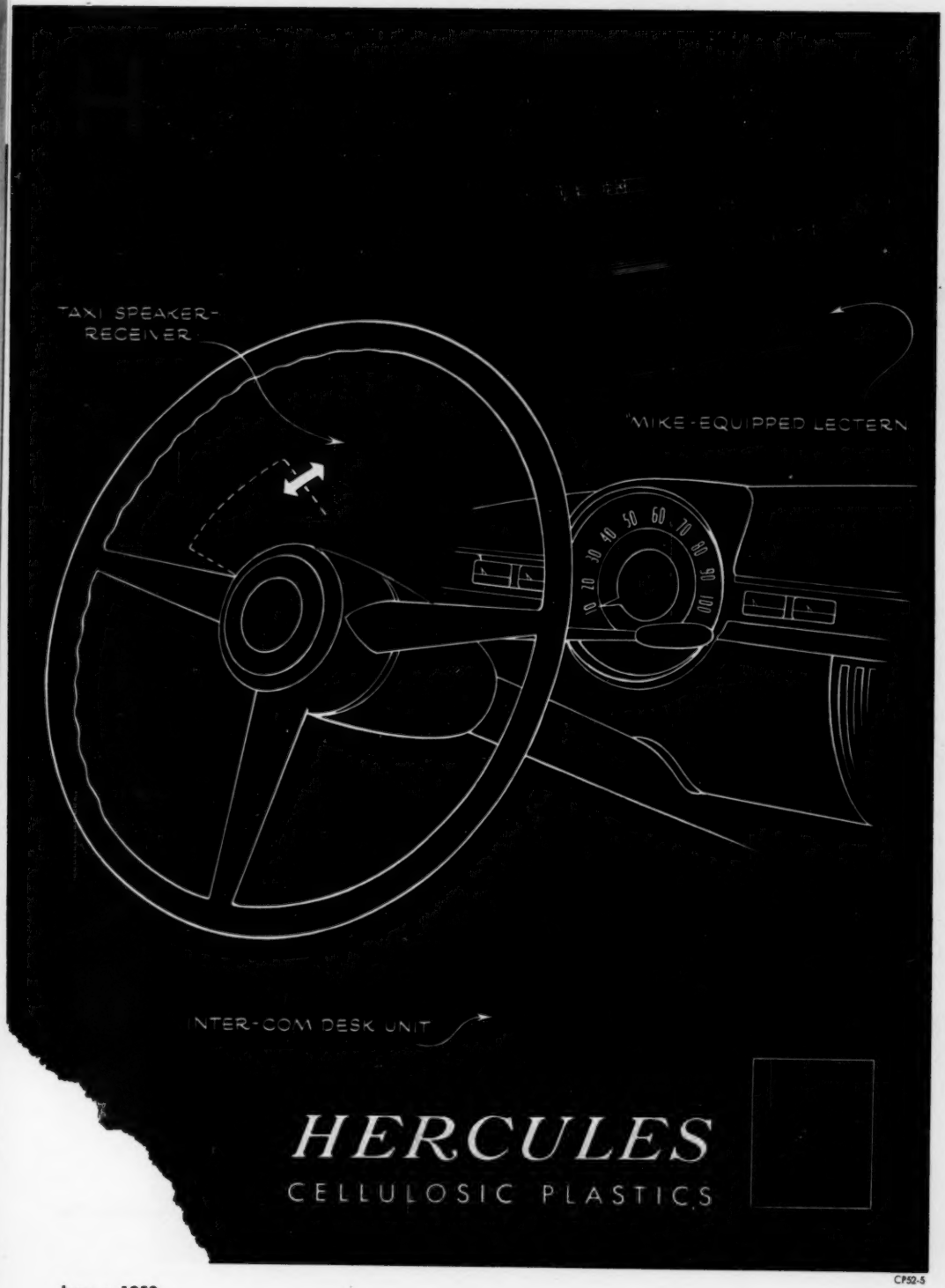
Original sketches for inter-com equipment, lectern, and taxicab unit by Sundberg-Ferar, Detroit, Michigan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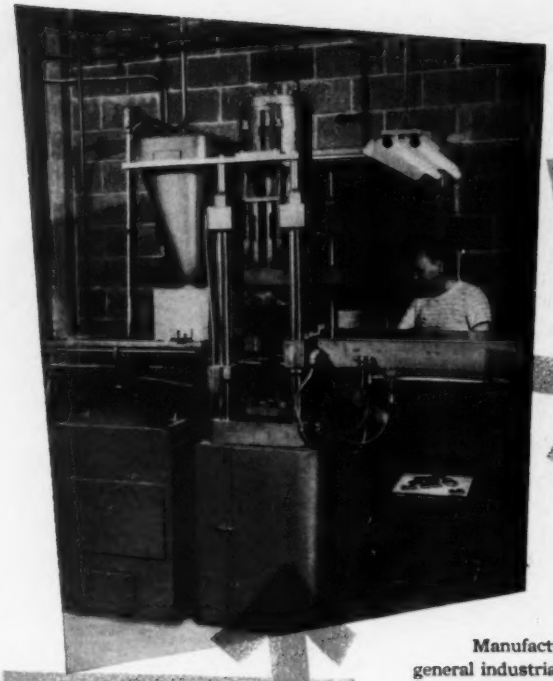

One of the Stokes fully automatic molding presses at Mechanical Products' plant, Jackson, Mich. One operator can handle a dozen or more such presses.

Automatic Molding of Circuit Breakers Cuts Costs by 80%

Plastics parts for circuit breakers are produced on Stokes automatic molding presses by Mechanical Products, Inc. at Jackson, Michigan. Manufacturer of circuit breakers for both aircraft and general industrial use, Mechanical Products has cut labor and other production costs approximately 80% since purchasing Stokes presses. Product quality improved . . . rejects cut to a minimum.

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Stokes automatic plastics molding presses require only periodic filling of the hopper and removal of the finished parts. Material savings are substantial because of precise metering of material to the mold. Investment is low because automatic presses are self-contained and require no auxiliary equipment.

Let Stokes experts judge from parts or blueprints whether your products can be adapted to the high production and low labor costs of fully automatic presses. Stokes Advisory Service will also consult on all plastics problems including molding, extruding, or vacuum metallizing.

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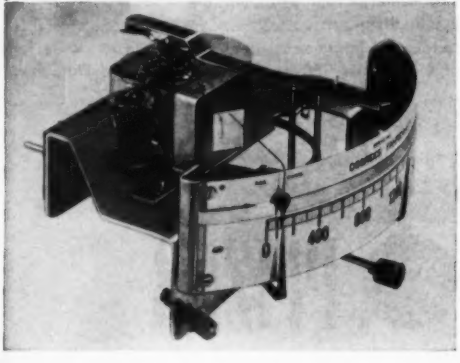
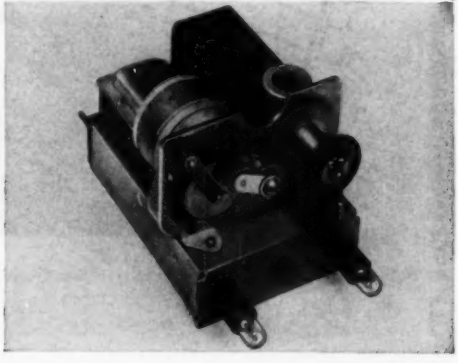
Galvanometer unit plugs into upper part of case.



Plug-in control unit fits into lower section of case. Interchangeable with two-position control unit.



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INTERCHANGEABLE CONTROL... *can be converted from proportional to on-off type simply by changing plug-in control unit.*

ADJUSTABLE PROPORTIONAL BAND . . . *set on calibrated dial, adjustable from 1 to 3% of scale span.*

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HIGH RESISTANCE CIRCUIT . . . *allows use of long leadwires.*

THE compact, indicating Pulse *PYR-O-VANE* Controller now brings the full accuracy of proportional control within the reach of many processes. At remarkably low cost, it affords sensitive, flexible control beyond the capabilities of two- or three-position instruments.

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The Pulse *PYR-O-VANE* Controller will set new standards of performance for countless processes . . . probably many of those in your own plant. Ask your local Honeywell engineer to give you full details. Call him today—he is as near as your phone.

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Modern Plastics BULLETIN

May 18, 1952

Expansion Plans at High Level

An expansion of capacity in the plastics and synthetic resins industry of from 2 billion 100 thousand lb. in 1950 to somewhere between 4 and 5 billion lb. by January 1, 1955, is the key behind the Defense Production Administration and the National Production Authority's theory in granting Certificates of Necessity for this industry. The figure includes all resins for protective coatings, but does not include cellulosics used in lacquers; in photo, movie, or x-ray film; in pyroxylin for coated fabric; in soil conditioners; nor materials used in synthetic fibers. Potential military uses as needed in the presently current garrison-state economy are included.

Even if there were to be an all-out war declared before January 1, 1955, it is difficult to ascertain how the total quantity allowed for in this program could be greatly increased. In such an eventuality there might be variations in the amounts of specific materials by providing for more of one type needed for war and less of another that does not fit particularly well in military items. Or some of the presently small-volume plastics that are especially valuable for war goods might be considerably expanded over present plans. By and large, however, it doesn't seem logical that the synthetic resin industry would, or could, build much greater capacity than that anticipated in this program if the country were at war.

A Guide Rule for New Production

The proposed expansion figure is by no means an iron-clad, positive declaration on which the Government must stand or fall. It is more a guide rule or measure to aid authorities in granting Certificates of Necessity for Tax Amortization. There should be no tax amortizations granted that would extend the national production capacity of a given material beyond the amount needed to fight a full-scale war.

Some adjustments have to be made in this philosophy, of course, because of a peculiar state in world affairs which compels the United States to keep its civilian economy going at full blast while building a big-scale war goods enterprise. But generally speaking, the goal of every person working in NPA or DPA is to help build a machine in which there will be no missing parts if we should be called upon to wage global war tomorrow. In the meantime, they must interfere as little as possible with an expanding civilian economy.

The C.N.'s or T.A.'s (terms used interchangeably in reference to Certificates of Necessity for Tax Amortization) are granted to companies who produce a product which it is now thought would be needed for war goods and would be in scarce supply unless more facilities are provided. In order to encourage construction of these facilities, the Government will permit the manufacturer to depreciate his facilities somewhat faster than in the customary 10 to 12 years. Almost no C.N.'s have been granted that allow a 100% amortization in the abbreviated five-year period permitted.

Balance of Materials to Be Maintained

It can be readily seen that the business of determining the various amounts and percentages involved in such a highly complicated operation requires a wide knowledge of industry plans and possible military needs.

The Chemical Division of NPA has therefore made a survey of the synthetic resin and plastics industry and gleaned therefrom as reliable a group of estimates on future needs as it is possible to obtain. These estimates, together with various statistical and historical trends, have been consolidated and used to build a pattern for future needs. It is more or less like a budget that any progressive firm prepares to help guide its operations. It will be subject to changes or modifications as time and circumstances alter the picture, but at least it offers a planned pro-

gram by which applications for Tax Amortization can be acted upon and is aimed to prevent a skimble-skamble operation whereby expansion of one product may be permitted at an excessive rate and another may suffer from shortages.

Of course, it is possible for a firm to build a plant without a T.A. But it isn't likely that any plastics manufacturer is going to rashly butt in on this program until he has at least had a good look at what is in store in an already prepared plan and is well prepared to compete with what he sees ahead of him.

Plastics Production in 1955

After examining various sources of information and conferring with analysts in and out of Government, our estimate of the Government's estimates on the range of production capacity for some of the larger volume synthetic resins and plastics mentioned in the foregoing paragraphs is given in the table below.

The actual Government figures are not available for publication at press time and obviously some guesswork is involved in our estimate. However, previous figures released on benzol, phenol, styrene, and other programmed chemicals, give an indication of what may be expected for plastics. These factors, plus expected percentage increases based on past performance, give some idea of what may be expected in 1955. The only reason for printing such figures is to give some idea to plastics operators of the amount of plastics materials that may possibly be available in 1955 if present plans are carried out. There may be many events between now and 1955 that will change these estimates, but as of today, MODERN PLASTICS is willing to gamble that capacity of these leading volume plastics will be close to the range indicated in the table.

Estimated Capacity of Leading Volume Plastics and Synthetic Resins in 1955. (Solid resin only)

Materials	*In millions of pounds* *Production 1950*	*Estimated 1955 Capacity*
Phenolic	340	600 to 700
Styrene resins	355	700 to 800
Urea and melamine	220	300 to 400
Vinyls (all types)	380	700 to 800
All others	830	1500 to 2000
	2125	3800 to 4700

Note that the "All others" figures in the table include alkyd resins used almost exclusively for protective coatings and the production figure for such alkyds in 1951 was 400 million pounds. They might increase by 50% or more in 1955 and thus cut into a sizeable portion of the above figure. Polyethylene is due for a big increase, but we wouldn't even guess how much. Except for polyesters, which might go to anywhere from 100 to 300 million lb., depending on acceptability of war time products, we can't see any other than normal increases from a volume standpoint in other plastics. The specialty materials will grow but probably not to big volume use such as those listed above. Attention should probably be called to coumarone-indene and petroleum resins which are already at a 140 million lb. operating rate and therefore account for a good part of the "All others" figures.

Plastics for Defense Program

The increases look startling, but careful analysis indicates that these possibilities are by no means ephemeral. In the first place, plastics products for Defense Production take a good, sizeable hunk of the newly planned production. The best estimates we can get indicate that defense items in a garrison-state economy such as we have now will require anywhere from 300 to 800 million lb. of plastics a year.

The percent of plastics products for defense as it relates to total capacity is expected to vary from 10% in 1950 to somewhere near 20% in 1953 and then decline to 10 to 12% in 1955. This estimating is based on a philosophy which says that we will build a big defense machine that will reach its peak of material consumption in 1953 and taper off in 1955. The machine won't be used, we hope, except as a threat to keep Joe Stalin behind his boundaries. If we have to use the defense machine, the plastics then used will be much, much greater than the amount given above, but total production of all plastics probably wouldn't be much greater. Additional increment for actual war would have to come largely out of plastics planned for civilian usage. Some types, such as phenolics or polyethylene, might be almost entirely gobbled up by defense and essential civilian items if we go to war—such things as the silicones, fluorocarbons, nylon, and polyesters may require even more expansion in an all-out emergency. The cellulosics, too, might well require additional poundage because of their particular adaptability to certain equipment which won't be built in large quantity unless we are in a global fight.

Percentage of Increase to Continue

The percentage of increase per year seems reasonable, especially when military needs are taken into consideration. From 1935 to 1949 plastics and synthetic resins increased almost every year on an average of from 20 to 25 percent. The 1950 to 1954 increase is figured at an average of around 15% a

year. Percentages of increase generally decrease year by year when volume gets as big as it has become in plastics, but few persons can be found who believe that the plastics industry has anywhere near reached its peak or even a leveling off point.

Polyethylene Prospects

Almost 60% of the polyethylene produced for May distribution was turned back to producers for division among their customers as they saw fit. This compares to 40% in April and around 30% in previous months. The increase in "free" distribution comes largely from new production, partly from lower volume used for military purposes.

However, military usage is expected to start climbing again within a month or so. Production of assault wire which requires a polyethylene jacket has been declining steadily, but production of Spiral-4, a wire used in rear echelon communications, is expected to increase soon. At one time these two applications were reported to be scheduled for as much as 3½ million lb. of polyethylene a month, but that was months ago and the figure is no longer current; it is given here to help indicate the possible need for polyethylene in just one military program if a big war should break out.

Ordnance uses for polyethylene as indicated by DO orders are also showing gradual increases. They are now running ahead of polyethylene for military packaging which has heretofore been second in volume only to wire coating. It is expected that this trend will continue and constantly require more polyethylene. Balloons still use a comparatively small volume. Tow targets use a substantial quantity of polyethylene now, but will require much more as the Air Force grows and as increasing numbers of young pilots are trained in aerial gunnery.

Uncertain Military Demand

The above are only samples of military demands, but they are enough to indicate why polyethylene may remain on allocation for several months. Ordinarily when only 40% of a given material is needed for defense and essential civilian products, it can be taken off allocation, but there is still considerable doubt about polyethylene because of the uncertainty of possible military demand. Consequently, in order to prevent unequal distribution of DO orders among polyethylene producers, it is likely that allocation will be continued for several months at least.

The military take in May was 21%; essential civilian was about the same. The following uses are the only ones now on allocation: Office of International Trade for uses abroad in such things as wire and cable; Canadian Department of Defense; Petroleum Administration for pipe; mine pipe; camelback; communications purposes for such things as Alpeth cable where polyethylene replaces lead; wire and cable for power lines; bulk packaging for dried milk, chemicals and pharmaceuticals; miscellaneous, including medical uses. Some packaging purposes including pharmaceutical closures were removed from the allocation list last month.

Unknown Amount of Inflated Demand

No one is yet sure of how much present demand for polyethylene is inflated, but there has reportedly been a decline of over 50% in back orders of some of the leading processors in recent months. Back orders are not an accurate measuring stick since they have always contained much duplication, but they do help to show a sort of intangible feeling among processors that the supply situation may become easier in the near future. On the other hand, one of the best authorities in the industry believes that there will be insufficient polyethylene to supply all demands until a year from this summer when another new plant is scheduled to come in.

Aside from all its other known uses and already well known adaptability in packaging, producers believe that present use in this latter field is only a small portion of what is to come. Because of the potential growth of polyethylene as a packaging material, producers will move their available material into that field as rapidly as possible. They know that several years are sometimes necessary to develop new uses in packaging products and they want to have those markets tested and approved by the time new increments of polyethylene come along in the next two or three years.

Rubber and Styrene

The present easier availability of natural rubber in this country makes styrene monomer an easily available chemical. The strike by petroleum workers which cut off sizeable quantities of butadiene for rubber probably added to the styrene supply in storage since the styrene couldn't be used for rubber when there was an insufficient supply of butadiene to use with it. Some of the struck petroleum plants also furnish propane to styrene producers for production of ethylene used in the manufacture of styrene but it is probable that the styrene producers could get propane from other sources if needed.

March production of GR-S rubber was 63,429 long tons: April was 62,000; the May schedule is for 58,000 but it may be cut to 45,000 if the strike continues. From 50 to 57 thousand tons of GR-S was used monthly last year. The figure for February 1952 was 52 thousand tons after allocation was discontinued

but will probably go up to 56 or 58 thousand tons for the next few months and then drop off rather abruptly after the Government stops stockpiling its estimated 10 to 40 thousand tons a month of natural rubber.

More Monomer for Plastics

A 56 thousand ton rate of GR-S production requires about 25,600,000 lb. of styrene monomer. Capacity for styrene production is now estimated at about 66 million lb. a month, and more capacity is scheduled soon. Thus, some 40 million lb. might be available for plastics if the demand were high enough. Currently the plastics industry is estimated to be using less than 25 million lb. of styrene monthly in styrene plastics products sold to the public, and that figure includes styrene protective coating resins.

The Government is going ahead with its plans to have an 860,000 ton GR-S capacity available in case of emergency. Such capacity would represent almost 72,000 tons of GR-S a month and would require around 33 million lb. of styrene a month. But, as mentioned above, rubber production is expected to go down rather than up; then the surplus capacity will be kept in stand-by shape. It is expected that the Government will provide for mandatory use of at least 450,000 tons of GR-S annually. At that rate about 17 million lb. of styrene would be required monthly for GR-S.

Upward Climb Expected This Fall

Thus, it seems that under almost any conditions imaginable there should be plenty of styrene for plastics in 1952. The upward climb has been halted due to the temporarily depressed economic state of nearly all business, but sooner or later the potentialities in such products as large molded pieces, formed sheets, styrene copolymers, and protective coatings are certain to surge forward and take advantage of a monomer supply situation that looks as though it could run ahead of demand for some time to come, provided there are no delays in new facilities programs and a good supply of benzol is kept moving in from Europe.

The futures price for natural rubber is now in the 30¢ range, and since the Government's stock pile will soon be full, it's a cinch that more natural rubber will find its way into civilian products soon, thus reducing the demand for synthetic. Foreign sources are already clamoring about the need for the United States to keep up its purchases of natural rubber from the Far East in order to prevent economic chaos and resultant Communism in that area. Thus, styrene again becomes indirectly but deeply involved in international politics and the results will bear watching by the plastics section of the styrene industry.

Resorcinol

It is believed that resorcinol will soon be removed from allocation because of additional supplies and a decline in those markets other than in wood. The amount going to military uses, which is a sizeable portion, will thereafter be supplied by DO orders.

The situation regarding resorcinol glue for wood laminates is not crystal clear at the moment. It is possible that much more can be used in the near future than is now going for this purpose. Some 100 million board ft. of softwood laminates of the type used for trusses and boat ribs are now being produced. However, a considerable amount of urea and casein as well as resorcinol is being used in these laminates, but processors claim that resorcinol glue will eventually take over a much greater portion.

At the present moment there are also about 10 million board ft. of hardwood being used for marine purposes, and this material uses exclusively either resorcinol glue or modified resorcinol glue.

The softwood laminates mentioned above use 70 lb. of adhesive per 1000 sq. feet. This adhesive is about 50% solid resin; thus, 20 lb. of formaldehyde and 15 lb. of resorcinol are used per each 70 lb. of spread. The glue used for hardwood laminates is spread at the rate of about 60 lb. per 1000 sq. feet. However, the hardwood laminates frequently use pieces as thin as 5/16 in.; there may be as many as seven laminations and thus 50% more adhesive is required per board measure than the softwood laminates where inch-thick pieces are frequently used.

It is estimated that if the total 100 million board ft. of softwood laminates were to use resorcinol glue exclusively, 7 million lb. of adhesive and 1.5 million lb. of resorcinol would be required.

More Resorcinol Makes More Lumber

Estimators think that perhaps 300 million board ft. of wood laminates of this nature would be used annually in case of a big war—they go even further and believe it is possible that a civilian economy may use that same amount of wood laminates within a reasonable number of years. These estimators point out that the total lumber production in the country runs between 32 billion board ft. in poor years to 39 billion in good years. The cream of the crop is taken off in plywood logs and the less desirable wood is used for pulp. Therefore, a good part of the lumber produced is in the middle grades and there are lumber men who think that this middle grade lumber can be upgraded by producing more wood laminates. Resorcinol resin is being looked to as a possible way of bringing this idea to fulfillment, but the lumber men insist that somehow or other there will have to be a change in the price level before they can take advantage of their proposed method for making big wood out of little wood.

MODERN PLASTICS
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TRENDS IN TOYS

Courtesy Hercules Powder Co., Inc.

Saucy Walker doll "walks" across the room when led by the arm, moving her head and rolling her eyes with each step. Head, body, arms, and legs are molded of acetate

AS the nation's birth rate continues to climb, so does the toy market. Toys are big business, will be bigger and bigger. Plastics already account for more than half of the dollar volume of that business, but can capture a far greater percentage in the near future. Potentials are tremendous. The expanding market is not the whole story: there are still huge segments of the field which plastics have scarcely touched; there are the newer plastics from which to make better toys; there is new respect for the advantages of plastics on the part of toy buyers.

Plastics rule supreme in low-price toys but there is probably a greater opportunity for increased use of plastics in the field of quality toys, a field in which plastics have not fared so well in the past.

Until recently, plastics encountered heavy buyer resistance to their use in higher priced toys. Toy buyers, most of whom didn't know one plastic material from another, didn't see why one shiny plastic toy should cost more than another which *looked* exactly the same. But today buyers know the meaning of terms like "high impact styrene," "styrene copolymer," "cellulose acetate butyrate," and "vinyl plastisol." They have learned that different materials have different properties and that in plastics, as in everything else, "you get what you pay for." Thus they have begun to encourage manufacturers to use the best plastic for each application, rather than the cheapest material.

As a result, more and more quality plastics items are being produced and the field is wide open for many more. Various plastics materials are being used for toys and their success here will mean tremendous future markets for them.

Dolls

One of the most significant trends in toys in recent years has been toward greater realism. Plastics, because of their ability to be molded to intricate shapes, have been a major factor in that trend.

In dolls, the use of vinyl plastisols has added a new dimension of realism by making possible dolls which "feel" real as well as look real.[1] And the plastics industry is constantly discovering new ways to make dolls even more realistic. One manufacturer recently introduced a doll which actually has its hair rooted in its scalp instead of applied as a pasted-on wig.

The new Magic Hair Doll, made by Ideal Toy Corp., Hollis, N.Y., has a head molded of vinyl plastisol. The saran hair is inserted, several strands at a time, right through the scalp and is anchored in place by an adhesive on the inside of the head. The hair can thus be washed and combed repeatedly without loosening.

Another new Ideal doll acts real as well as looks real. The doll, called Saucy Walker, has a patented

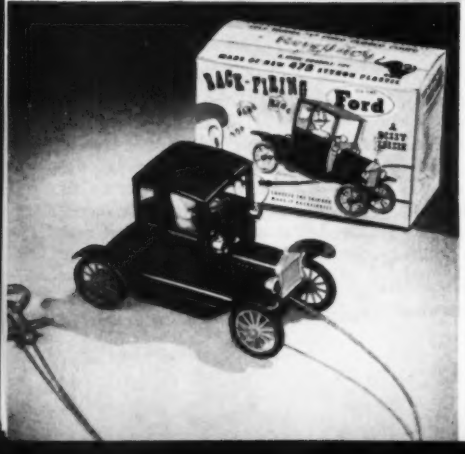
[1] See "Plastics from Head to Toe," MODERN PLASTICS 27, 164 (Jan. 1950).

Magic Hair Doll has head slush molded of vinyl plastisol. Saran hair is "rooted" in scalp instead of applied in the form of a pasted-on separate wig

Courtesy Hercules Powder Co., Inc.

Scale model of Ferguson tractor and disk harrow is molded of acetate, is made up of over 60 pieces

Realistic looking western set has acetate vehicles, styrene horses and men. Stagecoach is 13 in. long; doors can be opened



Styrene copolymer 1917 Ford is 7 in. long, has repeater cap mechanism so that it "backfires" whenever trigger on cable is squeezed

mechanism which makes it walk across the room step by step when led by the arm, moving her head and rolling her eyes with each step. The 2-ft.-high doll is molded of a special formulation of Hercules cellulose acetate.

Small Wheel Toys

Standards of realism have also been raised by the use of plastics in small wheel toys. ("Small" is here used to refer to toys too small for children to ride in, as opposed to "large" wheel toys such as express wagons and velocipedes). Before the advent of plastics, a small toy car was usually a roughly car-shaped piece of metal with "details" provided by lithography. In plastics, all but the lowest priced toy cars are virtually scale models of real cars with three dimensional details molded-in.

Plastics entered the small car and truck field at the low end of the price scale and took the major share of the market for items retailing for 29¢ or less. Then plastics began marching up the price scale and moving into other segments of the field. By 1948, they had become a major factor in the market for wind-ups retailing for around $2. By 1950, there were many plastic cars and trucks in the $5 range.

By 1952, there was only one part of the small wheel toy business where metal was still king. That was the market for elaborate trucks, 2 and 3-ft. long, selling for between $10 and $25. Until recently, manufacturers of these toys have stayed away from plastics because "plastics are not 'quality' and we are making 'quality' toys."

But plastics now have their foot in the door in that field too. One manufacturer introduced a large stake-body truck this year which has a cab, stakes, and wheels molded of acetate with a wall section of approximately ⅛ inch. That thick a section can be economically justified in toys in this price range. And with such wall sections, the plastic parts will prove extremely durable and will undoubtedly overcome the prejudice against them. It is safe to predict that plastics will be more widely used in toys of this type in the near future.

An excellent example of the manner in which small plastic toys can be given a realistic appearance is the

Freight station and switch tower for electric train sets are molded of styrene. Station has baggage cars which run in and out. Diesel (right) also has plastic housing

at the end of the cable is squeezed.

Information about the material used to mold this model Ford is printed prominently on the box. A few years ago neither buyers nor consumers would have been interested in knowing that the item was "made of new 475 Styron plastic." The fact that a manufacturer now thinks that information worth putting on the package in large letters shows how much buyers and consumers have learned about plastics.

The ease with which realism can be built into plastics toys has naturally led to the use of plastics in the model field. The example of longest standing is perhaps the use of plastics of various kinds in electric trains and their accessories. Lionel Corp., New York, N.Y., the pioneer in this field,[2] is continually

[2] See "Molding for Realism and Economy," MODERN PLASTICS 27, 162 (Jan. 1950).

Courtesy Celanese Corp. of America

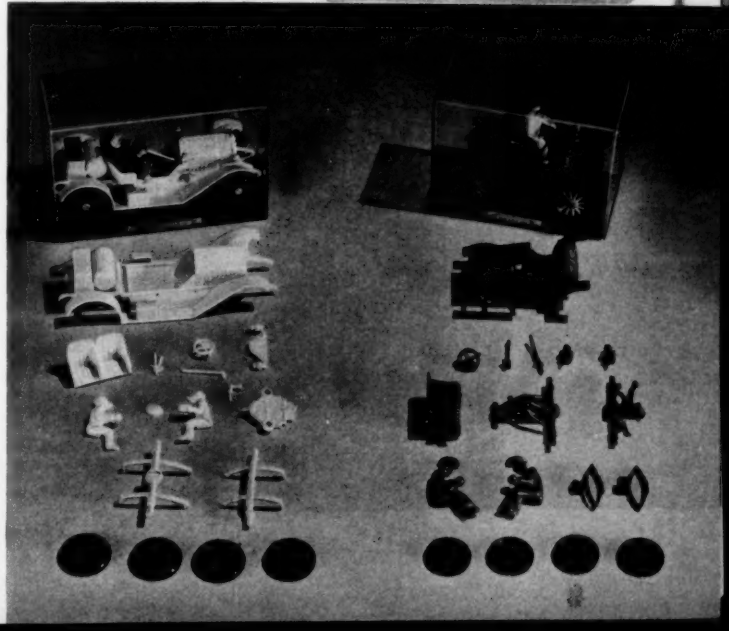
Construction kits for old cars are made up of molded acetate parts, can easily be assembled and decorated by painting headlights, etc.

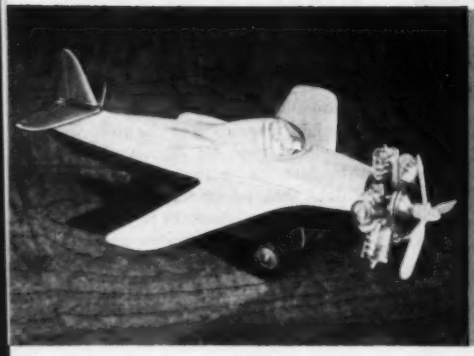
scale model of a Ferguson tractor and disk harrow molded by Majestic Molding Co., Elyria, Ohio, for Topping Models, Akron, Ohio. The toy tractor, molded of Hercocel acetate, is made up of over 60 pieces and has a metal implement bar which can be raised and lowered by a lever.

The western toy set made by Rel Plastics Corp., East Paterson, N.J., is realistic in appearance despite its low cost. This set consists of a stage-coach 3½ in. high and 13 in. long (including its four-horse team), a buckboard, a covered wagon, 12 horses, three drivers, and three riflemen. The vehicles are molded of cellulose acetate; the horses and men are styrene. The horses snap-fit into place on the hitches and are held off the ground so that the vehicle rolls freely. The toy gets added play value from the fact that the horses can be unhitched, the teams can be switched from one vehicle to another, and the men can be removed. An added touch of realism is a stage-coach door which can be opened and closed. Only in plastics could this realistic 24-piece set be produced to retail for just under $3.

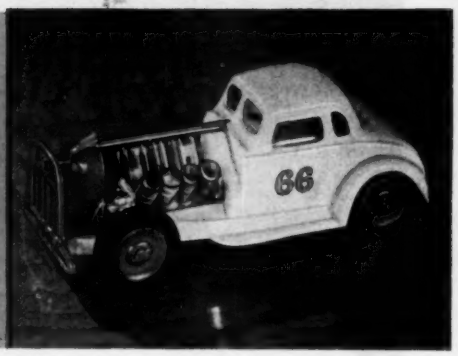
Realistic in still another way is the 7-in. long 1917 Ford molded of Dow 475 by Precision Specialties, Inc., Los Angeles, Calif. The unusual feature of this toy is a mechanism built into the bottom for firing caps so that the car "backfires" whenever the trigger

1914 Stutz Bearcat (left, below) and 1900 Packard (right) are two of the models in series of car model kits





Toy plane and stock car molded of acetate have transparent cylinder heads so that child can see how pistons move. Both toys have friction motors. Plane has polyethylene prop



Blocks molded of styrene are simplified version of bells used by Swiss bell ringers, are labeled with names of notes. Child can follow "sheet music" and play simple tunes

Water pistol shaped like a jet plane shoots six streams of water at once from "guns" under wings

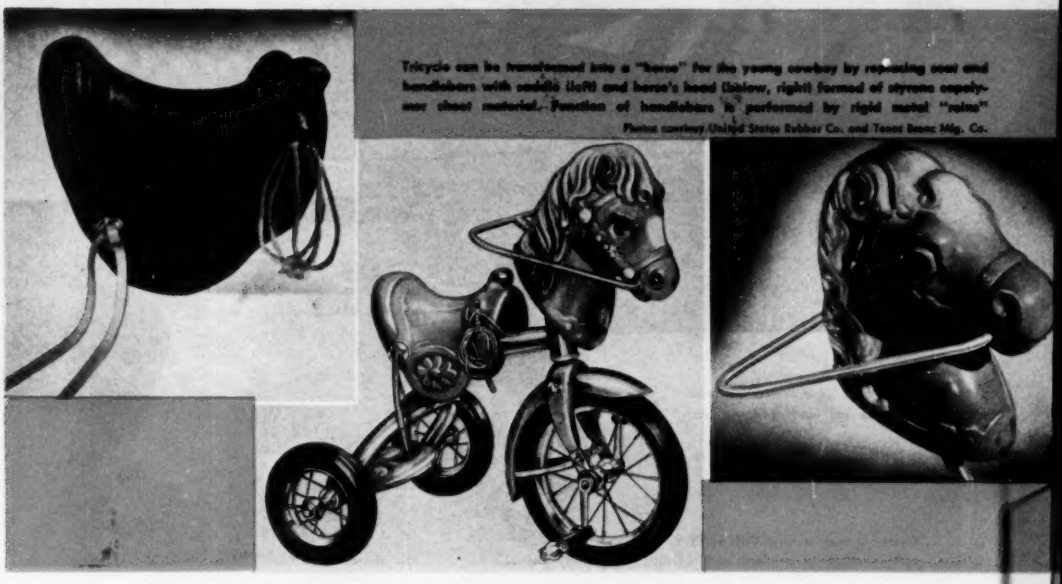
bringing out new plastics items. Recent examples include a switch tower and a freight station, both molded of styrene.

Low-cost construction kits for ⅜ in. scale models of old automobiles are another new application of plastics in toys. Precision Specialties, Inc., molds the parts for such cars as a 1903 Cadillac, 1909 Stanley Steamer, 1914 Stutz Bearcat, and Fords of various vintages. The parts are molded of acetate and there are about 17 parts in each car. They can easily be assembled for use as either toys or ornaments.

New Designs

Because plastics are relatively new materials with new properties and new methods of production—when compared with metal and wood—it is only natural that they should be used to create new and ingenious toys or to bring new features to old items. For example, the transparency of plastics is used ingeniously in a series of small wheel toys made of cellulose acetate by Nosco Plastics, Erie, Pa. Last year Nosco brought out a "hot rod" with a transparent engine through which the pistons could be seen "in operation" as the toy rolled along. The pistons, molded of bright colored acetate, were snap-fitted to a molded crankshaft which was in turn geared to the wheels with molded acetate gears.

This year Nosco has applied the same principle in its Vizy Vee Stocker and its Cloud Hopper. The V-8 type engine of the stock car and the 5-cylinder radial engine of the plane both have transparent cylinders and both toys are driven by friction motors. Both items have metal



Tricycle can be transformed into a "horse" for the young cowboy by replacing seat and handlebars with saddle (left) and horse's head (below, right) formed of styrene copolymer sheet material. Function of handlebars is performed by rigid metal "reins"

Photos courtesy United States Rubber Co. and Texas Bronc Mfg. Co.

motors, and rubber tires; all remaining parts are molded of acetate.

Toy blocks went from wood to transparent plastic several years ago. Now the blocks have taken on a new job of entertaining youngsters with the advent of the Karillon blocks molded of styrene by Kusan, Inc., Nashville, Tenn. These blocks are a simplified version of the bells used by Swiss bell ringers and can be used to play simple tunes. Each block in the Karillon set has solid plastic sides. Each has a metal bell attached to the bottom and a clapper suspended from the top so that the block sounds the proper note when it is shaken. The eight blocks are labeled "do," "re," "me," "fa," "sol," "la," "ti," and "do." A book of simple "sheet music" accompanies the set.

Kusan has also introduced an unusual water pistol molded of medium impact styrene. The pistol, called the Kusan Komet, is shaped like a sleek jet plane and fires six jets of water at once. Pressure on the single trigger below the fuselage sends a stream of water out of each of the six "guns," three under each wing.

Toys Formed From Sheet

All of the toys mentioned above are molded items. But vacuum forming of sheet stock is fast becoming an important process in the plastics field and will undoubtedly make its mark on the toy field.

A pioneer application in this trend is the horse's head and saddle which can be attached to a velocipede in place of the handle bars and conventional seat to transform an ordinary "trike" into a "horse" for a young cowboy. The head and saddle are formed of Royalite styrene copolymer sheet material and are marketed by Texas Bronc Mfg. Co., Kansas City, Mo.

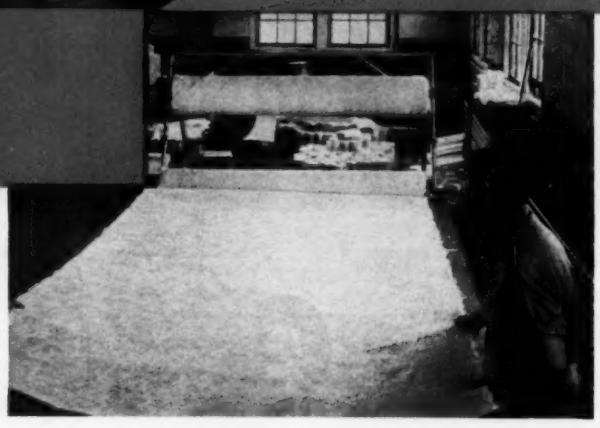
The possible uses for formed sheet in the toy field are numerous. A one-piece body for a pedal-powered auto has been made of Royalite on an experimental basis. And if that is as practical as it seems to be, express wagons, baby carriages, and other large wheel toys may follow. This one material and process could give toy designers plenty to think of for a while. And before they've exhausted the possibilities of formed copolymer sheet, the plastics industry will have come up with some new materials and processes which can be used to produce more and better plastics toys.

Body of pedal-powered car is formed from single piece of styrene copolymer sheet material with integral color. It is rust-proof

Courtesy United States Rubber Co.

Tanks

Corrosion-proof tanks of polyester resin-impregnated Fiberglas are used on desert truck



Fiberglas mat is stretched out from a roll onto a table to prepare it for being cut

CAMEL caravans have long since been replaced by truck convoys for the transportation of diesel fuel, gasoline, and potable water, by the Arabian-American Oil Co., in their Saudi-Arabian desert operations. One difficulty they encountered, however, was the vulnerability to corrosion of the steel tanks used.

Replacement costs of the steel tanks became such a problem that Aramco decided to investigate other materials. They finally turned to Carl N. Beetle Plastics Corp., Fall River, Mass., because of a statement that tanks could be made of polyester resin and Fiberglas reinforcement, which would out-live the steel tanks, and would be much lighter on a capacity-weight basis.

Carl Beetle, general manager of the plastics company, spent about a year in research, testing, and planning before the first tank was completed. Now he receives bare chassis (with cab) from truck manufacturer Kenworth in Seattle, Wash.; molds the plastic tanks and other parts; makes the bronze fittings, steel cradles, and other metallic components; mounts the tanks; and ships the vehicles to Arabia.

Lighter Weight, More Capacity

When steel tanks were used, one type of truck was equipped with a tank with a capacity of 1500 gallons which weighed 2300 lb. empty. The present method makes use of two plastic tanks mounted on the truck. Each of the plastic tanks weighs 1000 lb. and has a capacity of 1000 gallons, which figures out to a 50% increase in capacity on a capacity-weight basis. In addition to these two fuel tanks, each truck is now equipped with one 100-gallon water tank of the same plastic material.

The roads in the Arabian desert over which these trucks must travel present many hazards to driving. It is not uncommon for a truck to be turned over on its side and here the new plastic tanks offer an added advantage. For those occasions when the tank is ruptured, repair kits are available in Arabia to make quick repairs. This type of repair requires only simply cleaning out the ruptured area, and closing and reinforcing of the rupture with plastic-impregnated Fiberglas mat which is available in the repair kit. When a steel tank is ruptured, it is of course not only necessary to weld up the break in the steel, but also, in the case of inflammables, to drain the tank and thoroughly steam-clean it before welding.

Because economics play an important part in the manufacture of such large plastics items as these 1000-gallon tanks, it was necessary that mold or tool charges be kept to a minimum. Drawing on the techniques used for manufacturing polyester-Fiberglas boats for many years, Beetle was able to set up for the manufacture of these tanks with one wooden male mold sufficiently large to lay up one half of a completed tank. With the exception of the few hundred dollars this wooden mold cost, there was no additional mold expenditure.

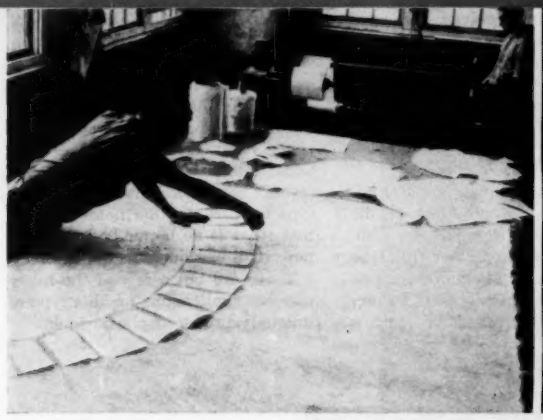
Laying Up the Mat

The outer surface of this wooden mold was carefully coated with wax and polished, to provide a parting surface. An approximately 1/16-in. layer of mineral-filled Laminac polyester resin was then sprayed on the surface. This resin was filled with Celite[1] (pulverized mineral), and colored with a white paste[2] specifically made to be compatible with polyester resin. Fiberglas mat cut to pattern so that it would snugly fit the contours of the male mold was then laid up on the mold, with a specially catalyzed resin sprayed on each layer after it was laid up.

This method of catalytic cure is unique with Beetle. It is known as a 3-step cure, using three differ-

[1] Mfg. by Johns-Manville Co.
[2] Mfg. by Calco Div., American Cyanamid Co.

for the Desert

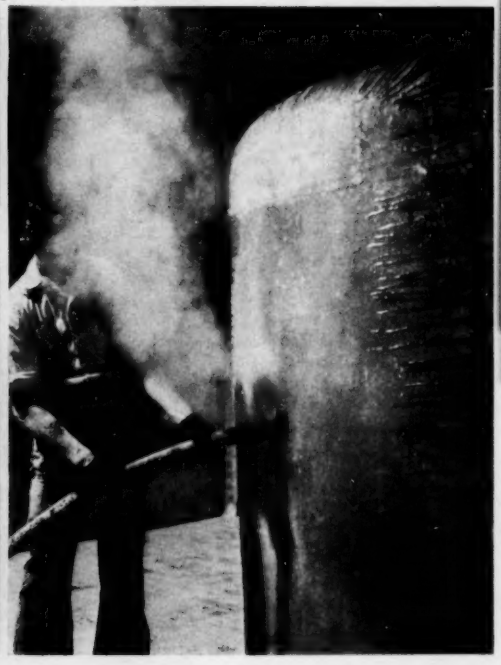


From the rolled out Fiberglas mat, strips are cut to pattern by the operator so as to conform to the contours of the male mold and provide a snug fit

Fiberglas strips are laid on polished wooden mold which has been sprayed with layer of mineral-filled Laminac polyester resin

Photos both pages courtesy American Cyanamid Co.

As each layer of Fiberglas is laid up, specially catalyzed resin is sprayed on; the finished product is stronger yet lighter than steel



Final cure of completed tank structure is effected by shooting live steam into interior through a 2-in. hose connected to a steam boiler

ent catalysts which are activated at different temperatures over a range from 70 to 200° F. Thus the final cure cannot occur until the lay-up has been subjected to a temperature in the neighborhood of 210° F. This in itself is the secret of the success of this job, since the two halves of each tank must be joined together after they have been removed from the male mold. Also, they must be reinforced both inside and out with resin-impregnated Fiberglas tape, before final cure occurs, in order to get a perfect bond without loss of strength at the joint. This joint between the two halves of the tank is known as a ship-lap joint, and when properly reinforced is probably stronger than any other section.

The final cure of the tank structure itself is accomplished in an unusual manner. A 2-in. hose connected with a steam boiler is placed inside the tank, and steam is allowed to pour into the tank, thus raising its temperature to the point required for the high-temperature catalyst to react. The various bronze port-hole fittings, valves, and steel supporting straps, are then assembled in their proper location and securely anchored in place with additional polyester-impregnated Fiberglas mat.

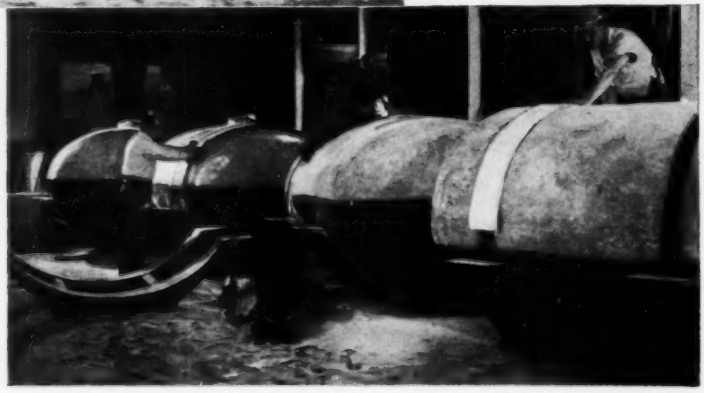
Other Tank Uses

Although the number of tanks required by Aramco will not keep the company busy indefinitely, Mr. Beetle has high hopes for this type of tank for use in many other applications. Having been a boat builder and yachting enthusiast all his life, Mr. Beetle is familiar with the rusting problems encountered with gasoline tanks in various yacht and service stations which are located near or on the water. He claims that even though a plastic gas tank might cost twice as much as the present steel ones, there would not be any corrosion problem, and such tanks would last indefinitely instead of having to be replaced every few years. He also points to storage tanks used for small oil wells, especially those storing crude oil containing salt and other corrosive materials, as a good market for this type tank. He further notes the fact that there is no better boat gasoline tank than one made in this manner.

These are but a few of the many possible applications for this type of uniquely produced plastic tank.

Bronze fittings and valves are assembled in their proper locations and securely anchored in place with additional polyester-impregnated Fiberglas

Photos courtesy American Cyanamid Co.



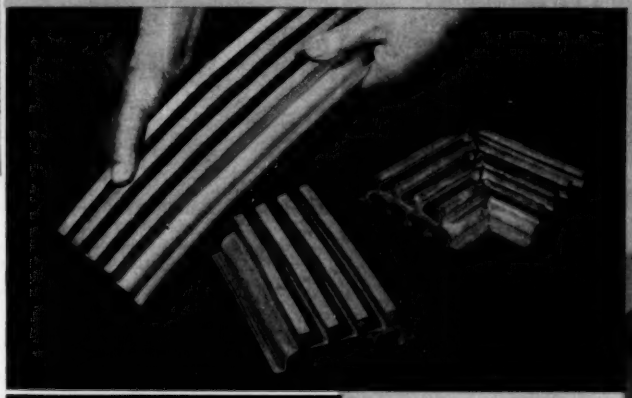
Resin-impregnated Fiberglas mat is placed over steel bands, which attach to bolsters and strap tanks in place, to make the unit one solid structure

Vinyl Strip Seals Concrete

Extruded elastomeric gasket offers construction engineers an improved method of forming joints between concrete blocks

Photos courtesy B. F. Goodrich Chemical Co.

Vinyl waterstop being placed in position in concrete form used in dam construction



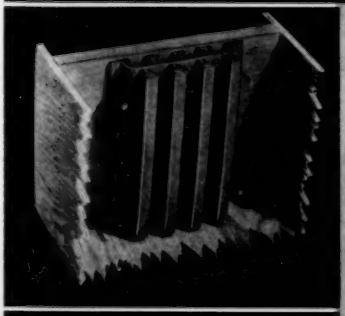
Right: Vinyl strip weighs 2.02 lb. per ft., is easily cut and is heat-sealable

IN building large structures, such as dams, the pouring of concrete is limited by the difficulty of mixing large quantities, eight-hour working days, and the necessity for dissipating the hydration heat of concrete. To meet these limitations, the pours must be divided into blocks. Because of the inherent shrinkage factor in all concrete and the absence of a true bond between the separate sections, an open crack forms between the blocks, creating a leakage problem.

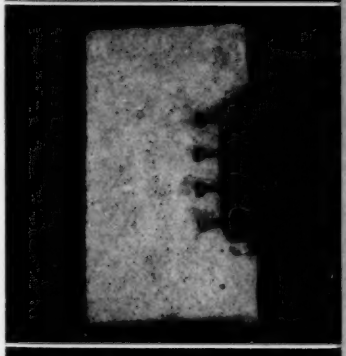
The newest and most successful method of overcoming this difficulty involves the use of a specially designed extruded vinyl waterstop developed by Harza Engineering Co., Chicago, Ill., hydraulic engineers. The elastomeric vinyl gasket, extruded of Geon resin by Perfex Plastics, Inc., Chicago, was used on the Guayabo Hydroelectric project in El Salvador, Central America. It is now being made available to the construction industry by Waterseals, Inc., Chicago.

The new plastic seal overcomes many of the difficulties encountered with materials previously used for this purpose—rubber and sheet copper. Splitting of forms is required to protrude rubber or copper seals, necessitating many hours of expensive carpenter labor. Rubber seals harden and become brittle due to oxidation. Edges of either rubber or copper seals (now difficult to pro-

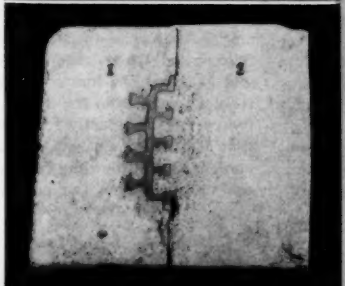
(*Continued on p.* 186)



Cross-section model of a concrete pouring form, made to show the ease with which new extruded vinyl waterstop is nailed in place



After the first concrete pour has been made around one side of the waterstop, the form is removed, leaving the other side of the strip open to receive next pour



Second concrete pour fills the open side of the strip, completing the seal, which remains effective even after concrete shrinks

Metal handle of acetate carrier can be raised for carrying (left) or lowered (right) for stacking. Holes in each compartment allow water to drain when carrier is washed

Because container is rigid, bottles are held firmly despite low walls. The fact that more of bottle is visible and the bright color of carrier make for effective display

Multi-Trip Coke Carrier

One-piece molded acetate carry-home container costs more than five times as much as paperboard, but lasts longer and costs less per trip

A SINGLE molded piece of cellulose acetate and a retractable metal handle make up a simple, durable carry-home container for six bottles of Coca-Cola. Despite its high initial cost as compared with the conventional paperboard carrier, the acetate carrier has an economic advantage in the long run because of its long service life.

The new carrier, called the Plasti-Cel, was developed and is being manufactured by Durable Plastics, Inc., Sherman, Tex. It is molded on a 34 sec. cycle in a 16-oz. HPM machine. The material used is Celanese cellulose acetate in "Coca-Cola red."

The metal handle, which is attached after molding, slides up above the height of the bottles for easy carrying, or retracts so that it is no higher than the bottles in the carrier to facilitate stacking. As an additional aid to stacking, six rings are molded-in to the under side of the carrier to keep it from sliding off the tops of the bottles below it when it is stacked for display or loading.

The Coca-Cola trade mark and other copy is hot stamped in white on the acetate carrier. The hot stamping is done with a pressure of 1500 p.s.i. and a temperature of 350° F. and results in deeply debossed lettering.

The initial cost of the Plasti-Cel carrier to a Coca-Cola bottler is $320 per thousand, which would seem at first glance to be way out of line with the $60 per thousand cost of paperboard carriers. However, the life of a paperboard carrier is only 2.7 trips and the plastic carrier is expected to average between 50 and 75 trips. The longer service life results partly from the durability of the carrier and partly from the fact that its neat appearance and convenience encourage the consumer to use it and return the bottles in it instead of simply throwing it away at home, after it has been used.

A further saving in cost is found because the uniformity and rigidity of the Plasti-Cel carton permit trouble-free automatic loading and unloading in the bottling plant. Labor costs are also reduced because the carrier does not have to be set up before loading as does the paperboard carton.

Because of its rigidity, the acetate carrier can hold the bottles securely with much lower walls than the paperboard container. Thus it leaves more of the bottles visible. In addition, the brilliant color and neat appearance of the carrier adds to its display value.

The fact that the acetate carriers are unaffected by moisture makes it possible to stack them for display outdoors. Holes which are molded-in to each compartment to drain off water during washing also serve to drain off rain water.

Better Film Viewers . . . With Plastics

PARALLELING the increasing popularity of photography in recent years has been the growing use of slide film viewers and projectors. And it is not surprising to find that the sturdiness, design freedom, light weight, inherent color, and production advantages of molded plastics have made them favored materials in this field.

Latest such plastics applications include a new stereo viewer and an internally illuminated direct type viewer made by Three Dimension Co., Chicago, Ill., and an indirectly lighted style 35-mm. film viewer made by Mico-Vue Co., Inc., Chicago. In addition, Three Dimension is using molded phenolic lens barrels for several projectors and has another application called the Selectray, which permits up to 30 slide films to be projected without the necessity of handling them.

The new Duo Vivid table viewer by Third Dimension works on the direct-view principle used in television sets. It requires no auxiliary screen or focusing, since the enlarged color transparency is seen directly on a 9 sq. in. rectangular glass lens. The smartly styled mottled walnut phenolic housing of the unit serves a dual purpose; it provides a mounting base for the working parts as well as a projecting hood which shields the lens against damage and shades the picture for comfortable viewing even in a lighted room.

Film slides are placed in the projector through a slot molded in the side of the housing. A hinged metal holder, which accommodates 2 by 2 in. slides, may be swung up out of the way, permitting larger slides to be placed in the aperture. Fully diffused light from behind the slides provides sharp detail over the entire picture area.

The use of molded phenolic for this housing made possible a streamlined, functional design and eliminated any need for supplementary surface finishing operations. Thermal insulating properties of the molded plastic keep the unit from becoming uncomfortably warm to the touch; advantage is taken of the electrical insulating properties in design of the lighting system.

This part is produced by Hauser Products, Inc., Chicago. This viewer was originally run in black general purpose phenolic but later switched to a walnut mottle which proved to have greater sales appeal. A deep-draw job, the housing is molded on a 200 ton compression press, using electronically preheated preforms. Threaded inserts in the base and at the corners of the viewing lens permit the lens and the internal metal parts to be securely mounted in place by means of bolts. The framed recess for the lens is produced by a shut-off in the mold cavity. The engraved metal name plate is cemented directly to the front of the cabinet. The diffusing screen between the bulb and the film consists of a sheet of white rigid vinyl material.

Slide Trays

The Selectrays are specially designed plastic trays used in conjunction with TDC's Selectron slide changer, which fits a number of projectors made by this company. The tray loading projection system eliminates the tedious job of inserting and removing each slide by hand; they feed directly from the tray into the projector and are returned in sequence, or in any other order desired by the viewer.

Each Selectray measures 7 in. long by 2¼ by 1⅞ in.; holds thirty 2 by 2 in. slide mounts. In use, the tray is placed on its side in the Selectron attachment. Teeth molded along one edge of the tray mesh with a metal gear turned by a knob, producing a rack and pinion arrangement which indexes the tray to any desired position. Each slide thus brought into position is then fed into the projector by means of an arm which pushes through molded slots in the bottom of the tray. After showing, slide is returned to tray without any need for handling it.

Originally, the Selectrays were

Photos courtesy Three Dimension Co.

Injection molded styrene slide tray with molded-in slots (right) is mounted on its side to projector (above right); slides feed directly from tray into projector (above) and the necessity for handling them is eliminated

Streamlined housing for table viewer is molded of mottled walnut phenolic

molded of phenolic material. However, demand for the units became so great that stepped up production was necessary. In order to obtain this objective without additional tooling, the original two cavity die was converted for injection molding. The job now runs in styrene on a 12-oz. Reed-Prentice press equipped with an I-M-S Meridian constant temperature circulator for close control of die temperature. Shrink fixtures further contribute to maintenance of close dimensional tolerances. The trays are made in two price ranges—the Custom type, molded in jet black styrene, and the Econo type, in mottled material. They are identical except for the color difference and the fact that the black trays are hot stamped with white numbers indexing the slide mount slots. This operation is handled by Rogan Bros., Chicago.

Lens Barrels

Two types of phenolic lens barrels are sold by TDC to fit several of the company's slide film projectors. The Trionar, 4⅜ in. long and approximately 2¼ in. in diameter, is produced by Hauser Products, Inc., and the Tridar, slightly smaller, by Harry Davies Molding Co., Chicago. The Hauser barrel is molded on a 150-ton hand press. Close dimensional accuracy is achieved by using a weighed charge and a rigidly controlled cycle. The barrels have a helical external thread to fit lens mounts and internal threads for lens retainer rings. The Hauser barrel is unscrewed from the cavity by hand while the Davies unit, molded on a 200-ton press, involves automatic ejection. Names of the lenses, focal length, and other data are intaglio molded on the front of the barrel and wiped-in in white. The plastic barrels enable TDC to offer high grade, economical lens assemblies since they are sturdy, fit the mounts accurately, and require no plating or other finishing operations.

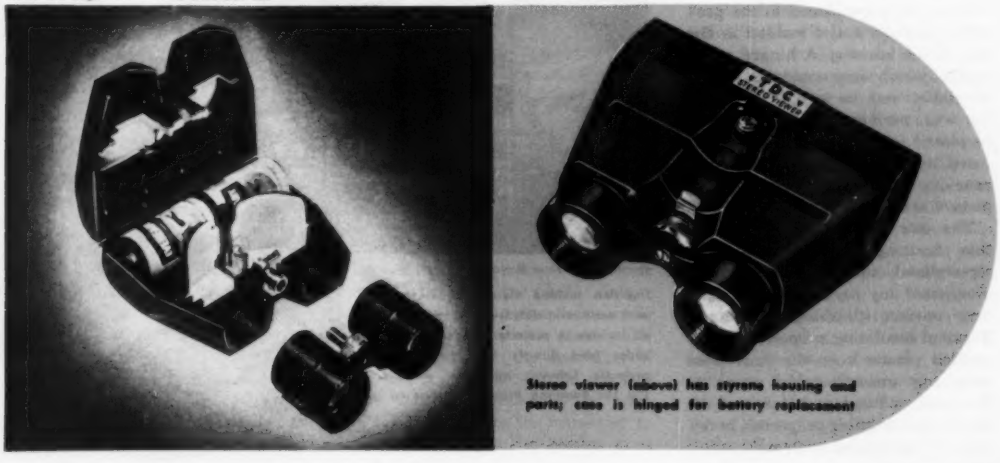
Stereo Viewer

TDC's new Stereo Viewer is designed for use with 1⅝ by 4-in. stereo slides of the type made by twin lens stereo cameras. The viewer includes a binocular-type mechanism which focuses both lenses simultaneously and is equipped with two standard D type flashlight batteries. Molded by Elmer E. Mills Corp., Chicago, the unit includes six plastic components—the two halves of the housing, the eyepiece molding, in which the twin lenses are mounted, two lens retaining rings, and the on-off switch, molded of red Lucite by Hauser, which glows when pressed down to light the bulb. All the other plastic parts are of jet black styrene.

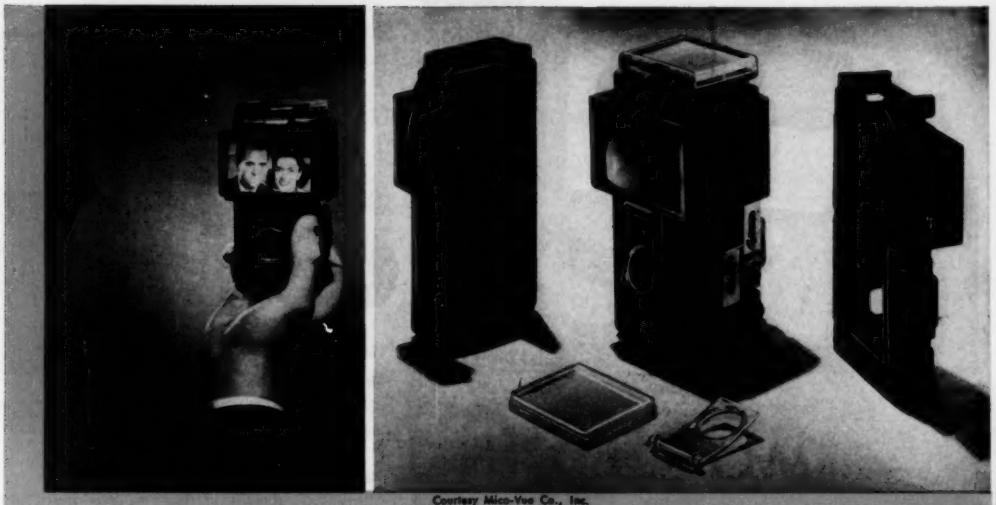
An accompanying photograph of this viewer with the eyepiece removed and the case opened up illustrates its construction. Batteries are held in place by a brass strip riveted to the lower half of the case. The switch is mounted on a spring so that when depressed it can be locked in the "on" position by means of an undercut near the top. The open view also shows such details as the internal ribs and fillets for added rigidity, the curved ribs in the top half of the case which hold the batteries securely when the housing is snapped shut, and the tongue and groove construction for a light-proof mating fit between the two parts.

Halves of the case are joined by means of a concealed hinge arrangement at the back. The stereo slides, which insert in a slot in the top of the case, are held securely by a metal clip which anchors at each end into slots in the top half of the unit. The eyepiece molding is moved in and out of the case for focusing ad-

Photos this page courtesy Three Dimension Co.



Stereo viewer (above) has styrene housing and parts; case is hinged for battery replacement



Courtesy Mico-Vue Co., Inc.

Film viewer (left) utilizes light which enters frosted styrene diffusor at top of unit and is reflected by angled mirror; four styrene parts of unit (right) are two case halves, diffusor (bottom left), and support (bottom right) for a hinged magnifying glass

justment by means of a threaded bolt which screws into a metal insert in the lower half. This insert includes a short internally threaded extension which anchors it into the plastic and accepts a small bolt from beneath used to fasten the spring clip which snaps the two halves of the case together. A sheet of white translucent rigid vinyl material which snaps into place in the light chamber provides evenly diffused light for viewing the film. Adjacent inside surfaces of the case are sprayed with a dull white finish for increased illumination, inner surfaces of the eyepiece with a dull black to eliminate light reflections.

Hand Slide Viewer

The Mico-Vue film viewer, molded and assembled by Elmer E. Mills Corp. for Mico Photo Products, is designed for comfortable, realistic viewing of ready-mounts, glass slides, and strip film up to Bantam size. It embodies a number of design and construction features made possible at reasonable cost through the use of molded plastics. All parts of the unit except the precision optical lenses, the metal slides on the film storage compartment, and the mirror are of injection molded styrene, in black, variegated brown, or variegated grey. According to "Mike" Wolk, president of Mico Photo Products and originator of the Mico-Vue, plastics were used in order to obtain economical production costs and greater attractiveness and color variety without the need for supplementary finishing operations.

The Mico-Vue is designed to operate without batteries or bulbs. Natural or artificial light enters the top of the viewer through a translucent diffuser, passing through the film transparency to be viewed and then striking an angled mirror, reproducing a brilliant, enlarged image on the 2½ by 1-in. glass magnifying lens recessed in the front of the viewer. This arrangement makes it possible for two or more persons to view a film simultaneously without eyestrain or fatigue, and also makes the unit ideally suited for direct viewing of films in window and counter displays.

The unique design of the Mico-Vue includes a storage compartment in the lower half of the case which holds up to 36 slide mounts. Slides are inserted into and withdrawn from this storage magazine through slots molded in the right side of the case. Chrome plated metal slides mounted on the side of the case may be moved to closed position when films are to be carried in this chamber. Another unusual feature of the Mico-Vue is a hinged magnifying glass which may be swung up in front of the viewing lens for close inspection of the center of a transparency. This optional magnification is particularly useful when negatives or film strips are being examined for enlargement or editing. The hinged mount for the magnifying lens is of clear transparent styrene.

Largest of the four molded styrene parts are the two sides of the case, which are cemented together to form the complete viewer. Before the halves are assembled, the reflecting mirror is slipped into internal grooves which lock it at the proper angle and the extensions on the magnifying lens support are slipped into openings cored in each side of the case, fastening this part in permanently and affording a hinge arrangement so it can be raised for use or returned to position in the recess molded in the front of the case. The lens is held in place by heat-formed ledged circular opening.

"Frosted" in the Mold

Following assembly of the two halves, the molded styrene diffuser slides into position from the right

(*Continued on p. 185*)

Five basic pieces in an all-plastic line of cosmetic containers can accommodate 15 different company products

MOLDED-IN LUXURY

Quality of contents is reflected in the handsome design of plastics containers for high-priced cosmetics

CARRIAGE trade cosmetics, packaged in what is probably the first all-molded, all-plastic line of containers of its type, have recently been made available to the public by The Erno Laszlo Co., New York, N.Y. To present the new high-priced entry to the retail field, Carl Otto, New York, designed a handsome group of packages that combine elegance with simplicity and modern lines with classical overtones.

Five basic pieces comprise the line of containers—an 8-oz. bottle; 2- and 4-oz. jars; a powder box; and a soap box—but they can be adapted to accommodate all 15 Laszlo products now on the market. Key design features incorporated in all five identify and integrate the package group:

1) The outer shells have a striated matte finish resembling dull marble that is achieved by using only slightly polished molds and doing the molding with high impact styrene—which has less natural luster than unmodified styrene.

2) Wall sections of the styrene shells are thick, lending solidity to the finished package, yet the shells are light in weight.

3) The "Erno Laszlo" logotype and framed, set-in panel for the product label, molded in high relief on the front faces of the styrene shells, and the raised credo on the back, are produced by using a split mold.

4) The black urea closures have a molded-in cameo on the top.

Product Compatibility

In the 8-oz. package, the rigid, square-shaped styrene shell encloses a blown polyethylene bottle of similar shape. Use of this material for the inner bottle, which holds the beauty preparation, insures product compatibility and is unbreakable. The polyethylene container is blow-molded by Plax Corp., Hartford, Conn., and fits snugly inside the styrene shell. Neck of the inner bottle, with its molded-in closure threads, protrudes through a circular opening in the top of the shell. Bottom of the shell is cemented to a molded styrene plinth which forms the base for the package and holds the bottle firmly in place.

The closure for the bottle is made in two parts: a square outer block and a round inner cap threaded to fit the polyethylene bottle. When the two parts are press-fitted, vertical splines on the outside of the round cap engage ribs on the inside of the square block to form a complete closure in which the cameo on the top is accurately registered with the logotype on the face of the shell.

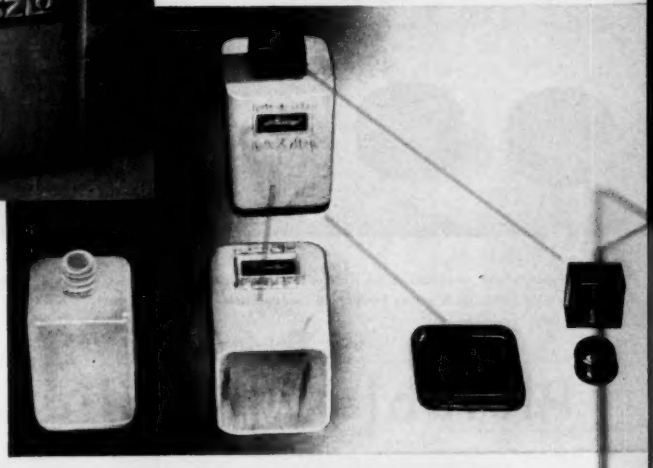
Construction of the 2- and 4-oz. jars is similar. A threaded inner bowl of translucent styrene is encased in the styrene shell. Two lugs on the bottom of the inner bowl fit into molded-in sockets in the base and anchor the inner container in position. A thin polyethylene seal fits on the top of the bowl and protects the contents. The urea closure is compression molded in one piece.

Versatile Molds

The powder box is produced by converting the split mold used for the shell of the 4-oz. jar. Because the powder container has no inner bowl, the closure threads are molded in one piece with the shell by setting in a mold conversion ring which carries the threads. Mold for the base of powder box is a conversion of the base mold of the 4-oz. jar; the mold has two interchangeable punches—one with sockets for the bowl lugs, one without them. A paper drum

Company logotype and credo in high relief are produced by molding styrene outer shell in split mold

Components of 8-oz. bottle are polyethylene inner jar, styrene shell and base, two-part urea closure



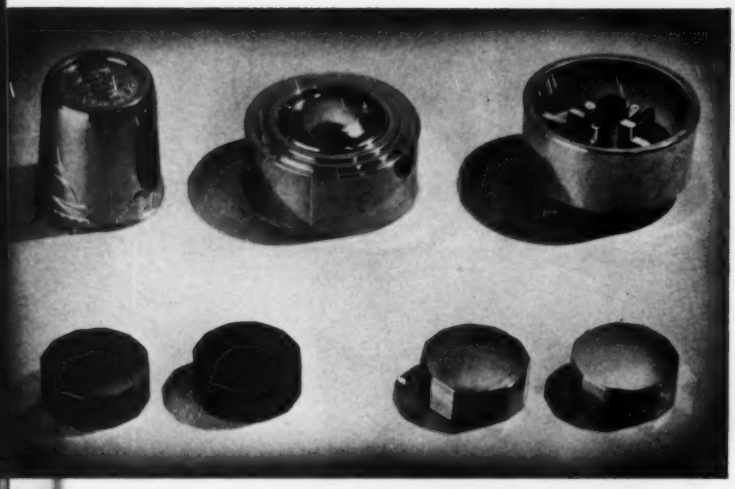
containing the powder is inserte through the bottom of the shell before the base is cemented in place. The same urea screw cap and thin polyethylene seal is used as on the 4-oz. jar.

Production of the soap box deviates slightly from the rest of the group, although the identifying design features are retained. The box is elongated rather than square in shape, and the top is molded of styrene instead of urea. The raised logotype panel is moved to the top of the container to match its position on the cake of soap.

High impact styrene is supplied by The Dow Chemical Co. and Monsanto Chemical Co. Bridgeport Moulded Products, Inc., Fairfield, Conn., and Colt's Mfg. Co., Hartford, Conn., mold the styrene containers; Colt's molds the urea closures, material for which is supplied by American Cyanamid Co.

Threaded styrene inner bowl (top right) of 4-oz. jar has lugs on bottom that fit into sockets in base (top left). At bottom are polyethylene lid, urea screw cap

Powder box is produced by converting mold for 4-oz. jar shown above. Threads are molded-in with shell; there are no base sockets; same screw cap is used



Jigger, knobs, and closures are molded of platable phenolic. Closure is shown at bottom (left to right) as it comes from mold, sandblasted, after copper bath, chrome plated

Platable Phenolic

Conductive compound can be used in the molding of parts which can be electro-plated directly in acid baths of copper, nickel, or zinc

PRODUCERS of phenolic have long believed that there would be a tremendous market for plated phenolic parts—if they could only develop a completely satisfactory method of direct plating. One answer to the plating problems involved is a phenolic material which is sufficiently conductive to be electro-plated directly. Such a material is now being made by Durez Plastics & Chemicals, Inc., North Tonawanda, N.Y.

Door knobs, faucet handles, and other hardware parts which do not require the strength of metal are possible fields for plated phenolic parts. Chrome plated automotive trim is another possibility. Plated phenolic could also be used for bottle and jar closures, escutcheons and other trim on electrical appliances, and in other applications.

Although all phenolics, like any other material, can be plated, they have never proved practical in the past for these applications. Non-conductive phenolic parts have to be given a conductive coating and the cost of applying this conductive coating is usually high; the adhesion of the electro-plate to non-conductive phenolic is not good.

The new Durez material (Durez 15615 Black) was specifically formulated for molding articles which are to be electroplated directly. It is sufficiently conductive to be plated by the usual techniques in acid baths of copper, nickel, or zinc. Because of its conductivity, it does not require sensitizing or silvering and bond between plastic and metal plating is exceptionally strong.

Molding and Preparation

Durez 15615 is a fast-curing compound with short flow characteristics. As a result, molding pressure, temperature, and cycle must be closely controlled, particularly in transfer molding. Radio frequency preheating cannot be used because the material conducts electricity readily, but other means of preheating are practical. Every precaution must be taken to avoid contamination by non-conductive materials which would cause spots which would not plate.

After molding, the resin surface should be removed to facilitate plating and to assure a satisfactory bond. Dry sandblasting is the only recommended procedure. Durez suggests using a free-flowing 320 mesh grit (such as Lionite, made by General Abrasive Co.) with a pressure of 15 p.s.i. at the nozzle. The finer the grit and the lower the pressure, the smoother is the resulting plate.

After sandblasting, the pieces should be cleaned by normal degreasing procedures to remove dirt picked up during or after sandblasting. If the contamination is not too great, steam cleaning is sufficient. The cleaning operation is followed by a dip in 10% sulfuric acid in order to prevent pH rise of the plating solution by carry-over of any rinse water.

Plating Methods

There are two methods which will produce satisfactory plating. The first is to use an acid copper bath to deposit a plate heavy enough to withstand buffing. A flash coat of nickel is then plated on the cleaned and buffed copper surface before finishing with chrome. This can be used on moldings with plain or convex surfaces and few sharp edges.

The second method is used for intricate pieces with surfaces hard to reach with a buffing wheel or with surfaces broken up with a complicated design. A nickel bath with leveling properties is used. The plated piece has a gray bloom which can be removed by a color buff or by a short plating cycle in a bright nickel bath. The parts have an excellent finish, but this method consumes considerable nickel.

In preparing and racking plastic parts for plating, it is important that adequate contact area be provided. Because of the limited conductivity of the phenolic, tight friction contacts are necessary. If the articles to be plated are longer than 4 in., a second contact may be desirable in order to obtain a rapid uniform initial deposition.

Translucent Venetian Blinds

SLATS extruded of styrene are used to impart a number of unusual qualities to the Venetian blinds recently introduced by Veni-Plex Corp. of America, New York, N.Y. From a purely decorative standpoint, the main advantage of the plastic slats is the fact that they are translucent and allow a soft, diffused light to enter the room. In addition, the styrene slats are light in weight, chip-proof, quieter and easier to keep clean than wood or metal slats.

The plastic slats are far from transparent; it is barely possible to see a shadow through them. But they do admit a small portion of the outside light, and they diffuse that light so that it becomes a radiant glow tinted with the color of the slats. This softly-diffused, colored light becomes a decorative element and can actually transform the character of an entire room.

Formed Cross-Section

The plastic slats are 0.014 to 0.015 in. thick and have shallow corrugations which give them a cross-section like a flattened-out "m." They are made of a Koppers styrene material and are extruded flat in the desired width. Forming is done after extrusion. The "m" profile gives the slats sufficient rigidity to retain their shape without sagging. It also gives the blinds a tighter closure, because the corrugations on adjoining slats overlap when the slats are tilted to the vertical position.

Although they are rigid enough to maintain their shape, the styrene slats are extremely flexible and will bend rather than crack or break. They are flexible enough to be wound around a finger and will spring back into shape as soon as released. Thus the slats can be pushed aside to get at the window catch without danger of breaking.

Because of the light weight of the plastic slats, an average Veni-Plex blind is half the weight of an aluminum blind and only one-quarter the weight of a steel blind. This makes it easier to raise the blind on any size window, and makes it possible to use a single blind to cover large windows or to cover groups of windows.

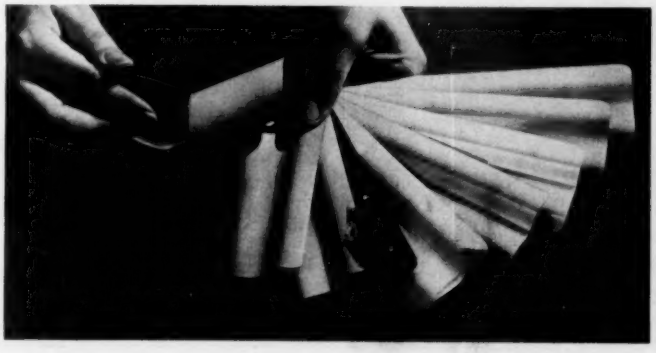
Since the color of the styrene slats is an integral part of the material, there is no paint to chip or peel. In addition, the smooth, glossy surface of the extruded slat is much easier to keep clean than a painted surface.

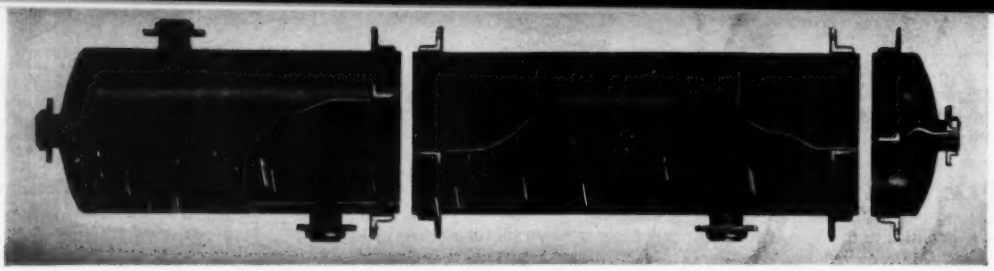
Colors used are peach, light green, dark green, yellow, blue, terra cotta, gray, eggshell, and chalk white. Twin ladder cotton tapes which hold each slat on top as well as bottom are available in a selection of colors.

The Veni-Plex blinds are custom made, and are available through Venetian blind dealers and department stores at about 10¢ per sq. ft. more than the best aluminum blinds.

Translucent styrene slats of Venetian blind admit a small portion of outside light as a soft, diffused, colored glow. Light weight of slats makes large blinds easy to handle

Styrene slats are formed to modified "m" shape to give them rigidity and prevent sagging. They will bend without breaking, will spring back to shape when they are released





Modified phenolic resin with inert carbon filler is used to cast towers for the absorption of gases and for liquid-gas interaction

Cold Cast Chemical Equipment

EXCELLENT corrosion resistance is one of the properties of a new modified phenolic resin with an inert carbon filler. The material, announced as the result of 17 years of research and service tests by Pennsylvania Salt Mfg. Co., Philadelphia, Pa., is being used in a new line of chemical piping, valves, pumps, etc., by General Ceramics & Steatite Corp., Keasbey, N.J. Known as Chemplas, this material is cold cast using an acid catalyst. The equipment made by General Ceramics is also known by the same name.

Chemplas covers a wide range of chemical process equipment needs. Physical properties are given in an accompanying table. Chemplas can be cast into extremely dense and homogeneous structures having low water absorption characteristics and resistance to all acids except those which are highly oxidizing.

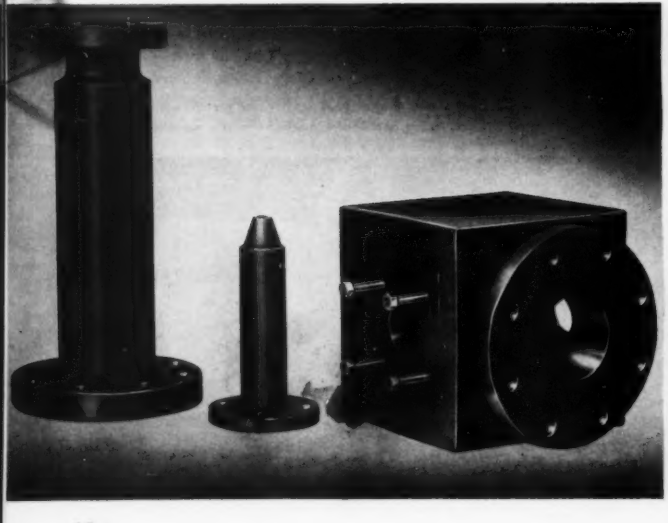
Outstanding proved applications of Chemplas, for example, are in hydrofluoric acid handling and in equipment where the material is exposed to ferric chloride and to hydrochloric and sulfuric acids. With certain resin modifications, equipment can be made which will withstand concentration of alkalies within certain temperature limitations.

Chemplas is particularly suitable for forming strong, dense castings. The casting process used permits outside dimensions to be held to within $\frac{1}{16}$ in.; inside tolerances can be held to within a few thousandths of an inch. If necessary, the parts can be machined to still closer tolerances. This fact, coupled with the extreme density of the castings, which eliminates pits and air pockets, makes possible the manufacture of precision parts.

Chemical Process Equipment

Pipe and fittings: Bell and spigot pipe used for liquids and gases at or near atmospheric pressure are a successful application of Chemplas. Their major use is for acid drain lines and duct work. For higher pressures, pipe can be equipped with special flanges cemented on

Excellent corrosion resistance of material makes it suitable for chemical equipment such as nozzles for exhausters. Casting process used makes the equipment economical



Hills-McCanna type diaphragm valves for varied applications are cast of modified phenolic material

with an acid-proof cement, or supplied with hubs and loose split metal flanges. Pipe and fittings can be further armored with a resin impregnated glass cloth which increases their physical strength.

Valves: Hills-McCanna diaphragm valves in sizes up to 8 in. are available, along with plug cocks, check valves, and safety valves for use with the piping described. There is also available an entirely new type globe valve which can be used either for manual or diaphragm motor operation and can further be adapted to a relief valve construction.

Centrifugal pumps: These units are so constructed that all parts coming in contact with the liquid being pumped are made of Chemplas. Most models have a simple rugged mechanical seal, but pumps are also made with standard stuffing box construction. Two designs are available—unarmored or armored with glass cloth and resin.

Towers: Chemplas towers for the absorption of gases and for liquid-gas and liquid-liquid interaction are manufactured; they are particularly adaptable as tail gas towers in hydrochloric acid absorption systems. Bubble cap towers are also available.

Vessels: Cylindrical jars, rectangular tanks, and other containers in sizes up to 500 gal. are fabricated.

The castings described above are light in weight and easy to install. In operation they are completely stable at temperatures up to 375° F., although a maximum operating temperature of 350° F. is recommended. The parts withstand all atmospheric conditions, and can operate under a wide range of temperatures without being subject to thermal shock.

Tests Under Corrosive Conditions

Prolonged tests under severe corrosion conditions were undertaken to determine the performance ability of Chemplas equipment with different chemicals.

One such test involved a process using impure, 60% hydrofluoric acid at elevated temperatures. Commercial equipment, both alloy and lined, failed after short periods. Chemplas towers, pumps, and fittings showed no trace of corrosive attack after two years.

In another test, pumps lined with Chemplas material handled a combination of sulfuric and hydrofluoric acid at 160° F. for 12 times as long as any special alloy or metal ever used.

In a third test, special Chemplas header fittings for heat exchangers outlasted the best material previously tried by 800 to 1000 percent.

In a special pumping problem involving low strength sulfuric acid with free chlorine at high temperature, six Chemplas pumps were in service for more than three years with no serious attack. Previously, no metal or alloy pump had ever been found which could give maintenance-free service for longer than four months.

Physical Properties of Chemplas

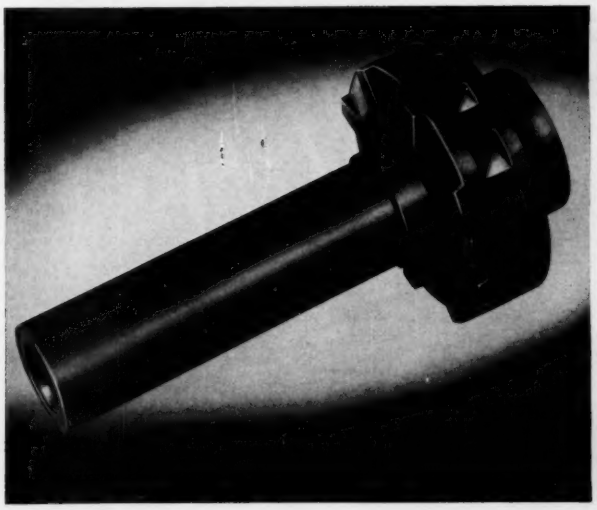
Compressive Strength, lb./sq. in.	12,800
Tensile Strength, lb./sq. in.	5,480
Modulus of Elasticity, lb./sq. in.	5.8×10^5
Water Absorption, %	0.08
Specific Gravity	1.45
Coefficient of Thermal Expansion	
per °F.	3.5×10^5
per °C.	6.3×10^5

Reinforced Pieces

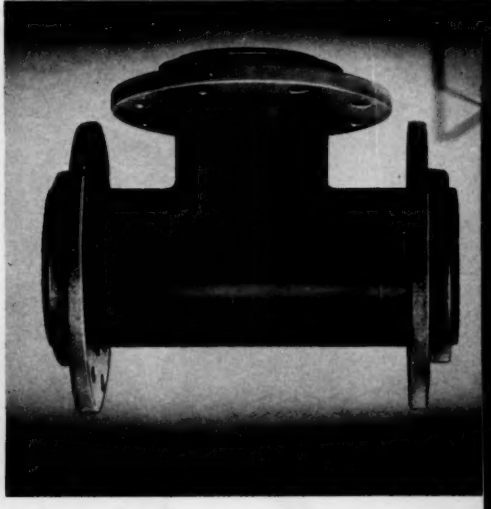
To enhance the mechanical and thermal shock resistant properties of the above mentioned equipment, a plastic-impregnated glass cloth armor has been developed. In setting, this armor shrinks onto the equipment producing an impervious covering, the strength of which approaches that of metals.

Armor also greatly reduces the possibility of fracture thus insuring greater safety. If a crack should develop for any reason, the piece is completely held together by the armor, preventing serious damage to plant or personnel due to fire, explosion, and toxic fumes and liquids.

Corrosion-resistant pumps can be made using new cold-casting material for all parts which contact liquid. Below is a closed type impeller for such a pump



Cast phenolic tee for high pressure piping assembly is equipped with flanges cemented on with an acid-proof cement



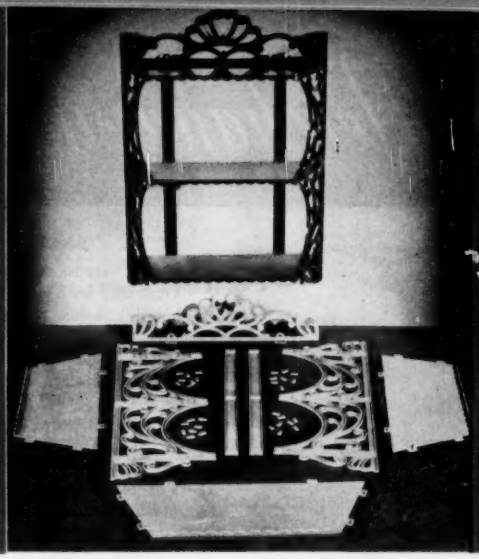
Deeply tufted vinyl valance has the most economical filler material possible: air. Valance is made of two pieces of 12 gage Velon sealed around the edges and spot sealed at certain points so that it gives a deeply tufted effect when inflated. Each 41-in.-wide valance has a different embossed surface or print on each side and is reversible. Made by Home Curtain Corp., 295 Fifth Ave., New York.

Swimming pool 8 ft. wide, 16 ft. long, and 4 ft. deep is made of wood and has a Vinylite plastic liner. The liner and drain are sold with complete directions for construction of the wooden framework, which is simple enough for any amateur carpenter to build. Thus it is possible for a home-owner to get a back-yard swimming pool for $125 plus the cost of the lumber. Made by U.S. Fiber & Plastics Corp., Stirling, N.J.

Accessory grip for Smith & Wesson police revolver is molded of Tenite II cellulose acetate butyrate. The grip, somewhat larger than the standard grip, contains storage space for six extra bullets. It is made in two halves which are screwed together. The durable, lustrous butyrate grip is molded by Niles Corp., 232 Weber St., South Bend 17, Ind., for George Wylie, 5320 Miller Ave., Gary, Ind.

Tags molded in one piece of Tenite II cellulose acetate butyrate can be affixed in jig time by simply threading stem through slot. The 1¼ by 2¼-in. tags can be marked with grease pencil or crayon and can easily be wiped clean. They can be used to identify plants, delegates at conventions, parts, etc. They are molded by Majestic Molding Co., Elyria, Ohio, for Ray-Craft, Inc., 1255 W. 4th St., Cleveland, Ohio.

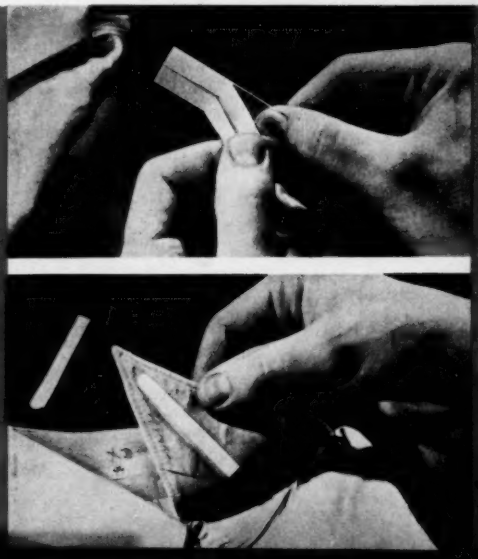
PLASTICS PRODUCTS



Knick-knack shelf molded of styrene is shipped flat. Interlocking parts can easily be assembled and held together with small molded styrene pegs. Shelf shown is 20½ in. high, 14 in. wide, and 6 in. deep, and is also available with mirror back. Knock-down corner shelf is also available. Molded in walnut, bleached mahogany, red, or yellow by Plastic Metal Mfg. Co., 3550 N. Spaulding Ave., Chicago, Ill.

Reel can for 16 mm. movie film is molded of transparent styrene. The complete contents of the can, including titles written or pasted on the reel, are thus visible without opening the can. The styrene can, called the Kodascope Transparent Reel Can, is made by Eastman Kodak Co., Rochester 4, N. Y.

Shirt collar stays made of Vinylite rigid sheet hold their shape despite temperature and humidity changes, but are light and flexible enough to prevent discomfort to the wearer. Stays have pressure-sensitive adhesive backing and are put on by simply pressing them on the back of the collar. They can be reused many times. They are made by Story Mfg. Co., 205 Lafayette Ave., Bellevue, Ky.



Pencil box has self-locking cover so that contents are not likely to be accidentally spilled. It is molded of styrene and has opaque tray and clear cover. Box comes with six crayons, three pencils, 6-in. ruler, and eraser. It is made by Best Plastics Corp., 6014 Eleventh Ave., Brooklyn 19, N. Y.

PLASTICS *Merchandising**

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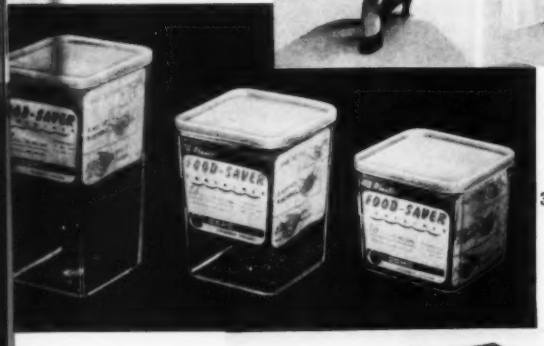

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1 **Sugar, creamer, shaker set**—Oval tray with convenient curved handles holds matching sugar, creamer, and salt and pepper shakers. All parts of the set are molded of pastel colored styrene. Set retails for 98¢.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago 45, Ill.

2 **Fur coat protector**—Cape made of vinylite film can be worn over fur coat to protect it from rain or snow or can be used to protect coat from dust while it is hanging in closet. Cape has rain hood and snap fasteners all the way down the front. Cape is designed full and long; length can be adjusted by cutting. It sells for $2.95.

Renick Boggs & Co., 412 N. Orleans St., Chicago 10, Ill.

3 **Quart container**—Line of containers for frozen foods now includes one which holds 1 qt. to fill line or 36 oz. when completely full. Pint and 1½ pint sizes were previously available. All sizes are molded of clear styrene and have polyethylene lids which seal on both inside and outside of container rim. Quart size retails for 45¢.

Como Plastics, Inc., 1703 Keller Ave., Columbus, Ind.

4 **Card table set**—Playing cards and score pads are available with daisy motif to match card table cover made of four gage Goodyear vinyl film. Cover is Hunter green with chartreuse lining and has large yellow and white daisy silk screened on corner.

Penthouse Products, Inc., 377 Fifth Ave., New York 16, N.Y.

5 **Flower vase**—Removable flower frog makes it easy to arrange flowers in modern-looking vase. Both frog and 6¾-in.-high vase are molded of Lustrex styrene. Vase retails for 79¢.

Ideal Tool & Plastic Co., 724 Second Ave., San Diego, Calif.

*Reg. U. S. Pat. Office

6 **Picnic set**—Four large divided plates and four 11-oz. mugs molded of styrene in assorted colors make up a lightweight convenient picnic set. Plates have deeply recessed food compartments and cup holder and molded-in napkin slot. The eight-piece set sells for $2.69 and additional pieces—cups and plates—are available for the set from open stock.

Columbus Plastic Products, Inc., Columbus, Ohio.

7 **Multi-color table cloth**—Six-gage vinyl table cloth has multi-color floral print on background of opaque white, frosted white, or translucent pastels. Cloth is 54 by 54 in. and is hemmed on four sides. It is packed in individual cellophane bag and sells for $1.69.

Hermann & Jacobs, Inc., 52 White St., New York, N.Y.

8 **Fly swatter**—Handle molded of styrene and blade molded of elastomeric vinyl make a lightweight, durable fly swatter. Vinylite striking surface is easily washable and will not snag upholstery or fabrics as will metal wire. It is also flexible enough to get at flies in corners or on curved surfaces. Swatter retails for 19¢.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago 45, Ill.

9 **Window sill protector**—Worn or faded car door window sills can be covered and protected with accessory molded of Tenite II cellulose acetate butyrate. The device, called the Protect-O-Sill, fits any car and can be clipped on in seconds without tools. The butyrate piece is colorful, wear-resistant, and remains comfortable to the touch all year around.

Tenna-Lite Corp., 312 W. Illinois St., Chicago 10, Ill.

10 **Towel rack**—Swinging arms of molded styrene towel rack can be expanded to 13 in. in length for large towels or can be telescoped to 7½ in. when not being used or when being used for wash cloths or small towels. The rack, called Extendo-length, can be used in either bathroom or kitchen. It retails for 49¢.

United Plastic & Tool Co., 8947 Exposition Blvd., Los Angeles 34, Calif.

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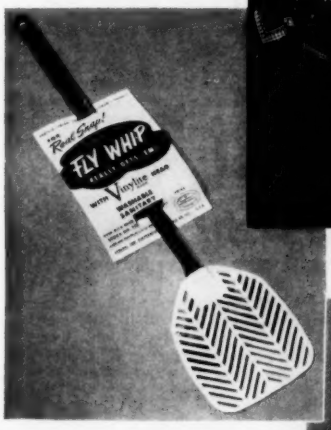

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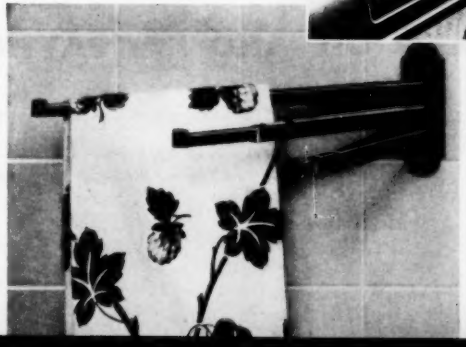
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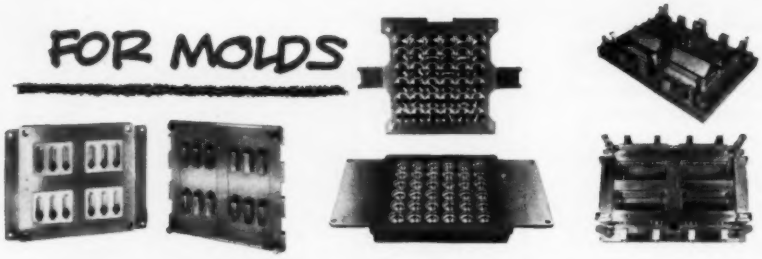
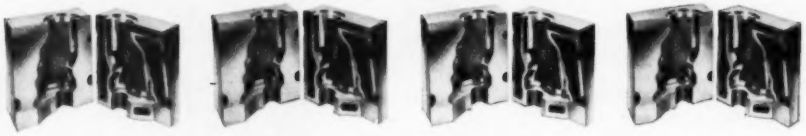
FOR MOLDS



FOR HOBBED CAVITIES



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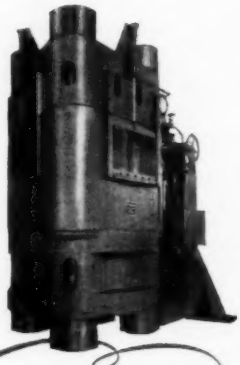

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Continuous Production of Polyester Pipe

FIBROUS glass-polyester pipe has been produced in many ways, ranging from hand winding or wrapping of impregnated cloth or mat on a mandrel to centrifugal casting in a spinning mold. Now a new and ingenious method[1] which bids fair to be highly successful has been developed by Carl de Ganahl. Co-inventors were Clare E. Bacon and John E. Grant.[2] By this new method, the pipe is built up on a vertical mandrel traveling upward through rotating turntables. It can be produced with a glass-smooth interior finish, which reduces fluid friction to a minimum, and with any desired wall thickness from 0.05 in. up. Further, the process is continuous and pipe lengths are limited only by the length of the mandrels used and the physical capacity of the building which houses the equipment. At present, pipe is produced by this method in 20 ft. lengths with the inside diameters ranging from 2 to 6 inches.

Layers of Glass

As now being made, this reinforced plastic pipe is built up of a number of layers. The first or inner layer is composed of one or more thicknesses of Fiberglas tape made from 10 mil surfacing mat bonded together with 22 roving ends per inch. Over this, Fiberglas rovings are spiralled on at a predetermined angle with the following layer consisting of additional sets of rovings spiralled on in the opposite direction. The next layer consists of a number of rovings equally spaced around the circumference of the pipe, but running parallel to its axis. Next, two thicknesses of Fiberglas tape similar to the first inner layer are wound on spirally under considerable tension.

All of these various layers, with the exception of the two outer layers of Fiberglas tape, are thoroughly coated with polyester resin before they are applied. Because the two outer layers of tape are wound under tension, the pressure thus built up forces the resin through the two porous outer layers, resulting in their thorough impregnation.

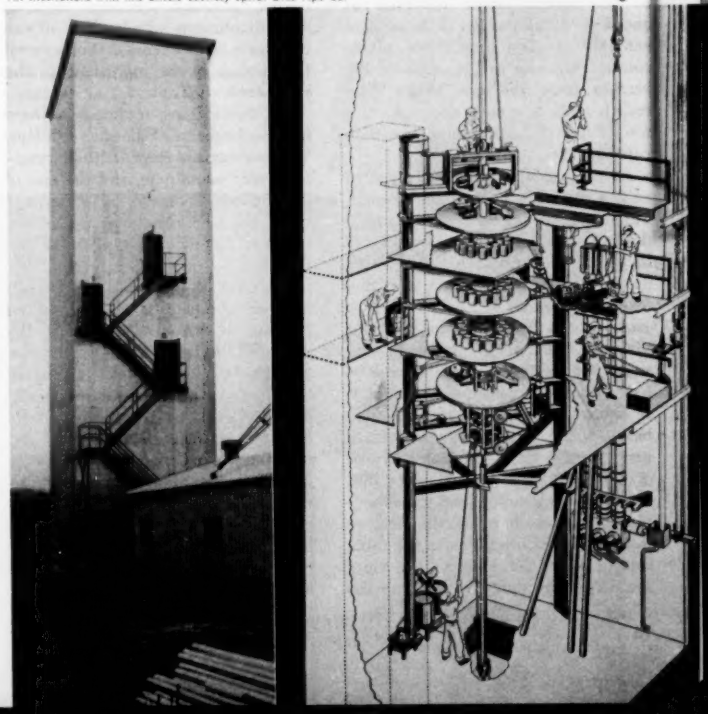
The plant for making this pipe is located in Old Bridge, N.J. The building which houses the pipe-making machine is a steel tower 75 ft. high and about 20 ft. square. The lower end of the pipe machine itself is about 23 ft. above the floor of the tower. The machine proper is about 21 ft. high, leaving the rest of the building height as working space for handling the wrapped mandrels before curing.

At the lower end of the machine is the mandrel drive mechanism consisting of three sets of four rubber-tired wheels each, one set above the other, arranged so that they push the mandrel steadily upward. Each mandrel is made from a 20-ft. length of mechanical steel tubing which has been centerless ground to close tolerances, plated with 0.003 to 0.004 in. of hard chrome, and polished. At the top end of the mandrel is a handling hook and a reduced diameter male end which will fit into the bottom end of the preceding mandrel.

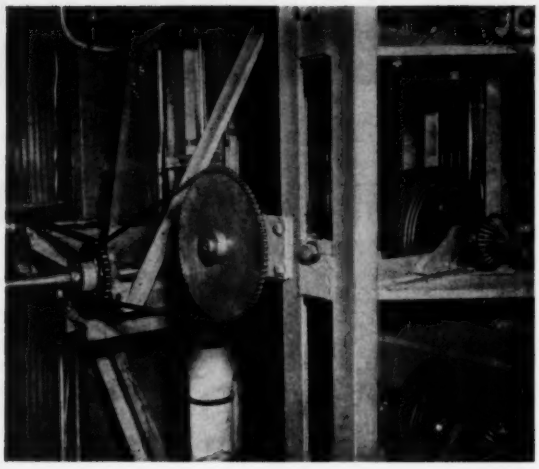
In the following description of the production process, the application of the glass layers is dealt with step-by-step. It must be remembered,

Left: Tower in which polyester-glass pipe is being produced. Right: Schematic drawing of the vertical production-line equipment, showing relative positions of rotating tables

All illustrations with this article courtesy Spiral-Glas Pipe Co.



* Reg. U.S. Pat. Office
[1] Patent applied for.
[2] Both of Owens-Corning Fiberglas Corp.



Mandrel drive mechanism has three sets of wheels, one above the other, geared to push the mandrel steadily upward through the work stations

Mandrel, coated with a release agent, is swung into position under the drive mechanism shown above and hoisted to engage drive wheels

however, that the process, once it has been started, is continuous and that the vertical mandrels follow one another in an uninterrupted sequence.

As the mandrel moves upward, it passes through an 8 in. hole in each of six round tables mounted at about 4-ft. intervals on a vertical center line. The first three tables rotate, each one in the opposite direction from the one below. The fourth table is a stationary one and the fifth and sixth tables are both rotating.

As the mandrel, previously coated with a release agent, passes through Table 1, it moves upward through a flexible diaphragm made of several layers of vinyl film. This diaphragm fits tightly around the mandrel and forms the bottom of a small circular tank 2 or 3 in. larger in diameter than the pipe being produced, and some 8 or 9 in. deep. This tank is fed with resin continuously, and it is always overflowing into a catch basin which drains into the main resin storage tank. Through the wall of this tank are vertical slots 180° apart, through which pass the Fiberglas tapes which make the first or inside layer of the pipe. As the table rotates about the mandrel, the tapes are pulled through the slots and the tank of resin, before being spirally wound on the mandrel.

Excess Resin Wiped Off

As the mandrel comes up through Table 2, which is turning in the opposite direction from Table 1, it passes through another flexible vinyl diaphragm, which wipes off excess resin. This excess dribbles down the surface of the glass tape to the resin tank on Table 1.

On Table 2 are mounted numerous packages of Fiberglas rovings. The rovings are kept in their original paper containers, and the end of each roving is drawn from the center of the package through a porcelain eye installed in the top of the package.

Each roving then passes through another porcelain eye mounted on the rim of an annular tank in the center of the table. From the eye the rovings pass under a chrome plated ring which runs circumferentially near the outer wall and the bottom of the tank. Between this ring and the mandrel are five rings of pins set in such a manner that, when properly threaded through them, the rovings zig-zag back and forth through the resin in the tank before reaching the mandrel and are thus thoroughly resin coated. Since the table is rotating around the mandrel, and the mandrel is moving upward, the rovings are drawn across it in the form of a spiral at an angle determined by the rate of the table rotation plus the upward movement of the mandrel.

As the mandrel passes up through Table 3, which is identical with Table 2 except that it is turning in the opposite direction, another spiral of rovings is laid on, in a direction opposite to the spiral laid on at Table 2.

Parallel Rovings

On stationary Table 4 is mounted a large number of roving containers and a resin pan similar to those on Tables 2 and 3. Here, the rovings are brought close to the outside diameter of the pipe by being drawn under a chrome plated ring which is just slightly larger than the pipe diameter at that point. Guides on this ring are so arranged that the rovings from this table are equally spaced about the pipe, and are applied parallel with its axis.

At rotating Table 5, a double layer of Fiberglas tape is wound on under considerable tension. This tape does not pass through a resin bath; there is such an excess of resin already present that this outer layer of tape

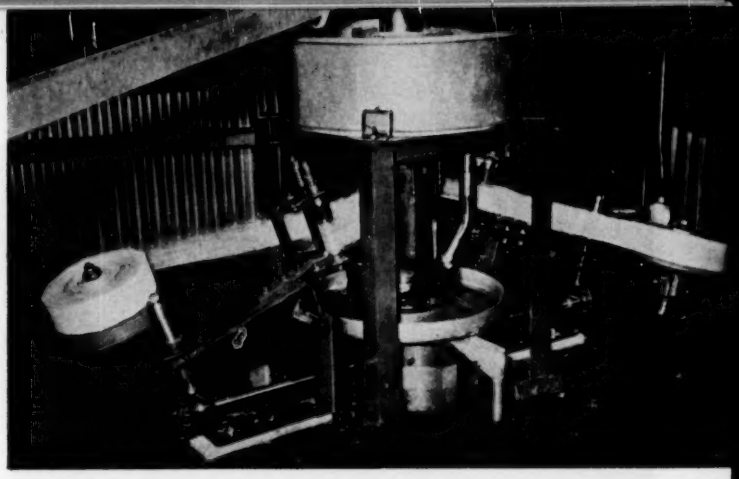
becomes thoroughly impregnated simply because of the pressure it exerts on the inner resin-loaded layers. Not only does the tape applied at Table 5 act as the outer layer of the pipe, but it also serves to reduce the resin to a minimum by compacting the inner layers and squeezing out all excess resin. The excess resin that is squeezed out through the outer layers of tape, dribbles down the surface of the pipe to the collecting pan previously described.

On Table 6, two wooden paddles, carried around the pipe on the rotating table, wipe off any excess resin that may have clung to the outer layers, and aid in compacting the entire layup. Mounted on Table 6 above the paddles are two coils of cellophane tape. This tape is wrapped around the layup under tension and serves to exclude air during curing. The cellophane wrap also acts as a female mold for the pipe.

Curing Ovens

Above Table 6 the completed layup passes through a set of soft-surfaced centering rolls and continues upward until about 21 ft. of pipe extend above the centering rolls. The layup is then secured with a waxed string just above and below the point of meeting of the two mandrels and the soft uncured pipe is cut between the two mandrels. The upper mandrel, complete with its layup, is pulled free by a block and tackle and moved into position just above a set of special ovens called curing pots.

Each curing pot consists of an 8-in. diameter aluminum tube about 22 ft. long, with a small steam pipe in the center. At the bottom of the curing pot is a standard commercial vacuum cleaner, which sucks air down through the pot. The mandrel with its soft uncured pipe is lowered into the pot and the upper end of the pot is covered with an electric heater. The suction unit is then turned on and air is pulled through the heater down through the pot. Curing time is approximately 30 min., after which the mandrel and pipe are removed from the curing pot and the pipe stripped off. The mandrel is then cleaned, coated with release agent, and returned to start its way once again through the pipe machine.

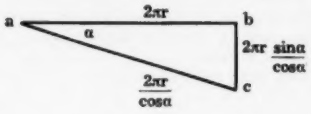


First layer of the pipe is a spiral winding of fibrous glass tape applied to the mandrel at rotating Table 1. Tape passes through a resin bath before reaching the mandrel

The design of this pipe is determined mathematically to suit bursting pressure and beamwise stiffness requirements. The following formula, derived by Mr. de Ganahl, illustrates the variations which can be mathematically determined for angles of lay and number of segments of rovings applied.

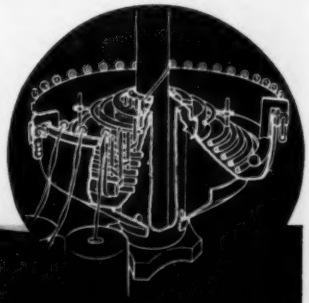
Mathematical Design

Consider a section of pipe as split and laid out flat. (See right above.)

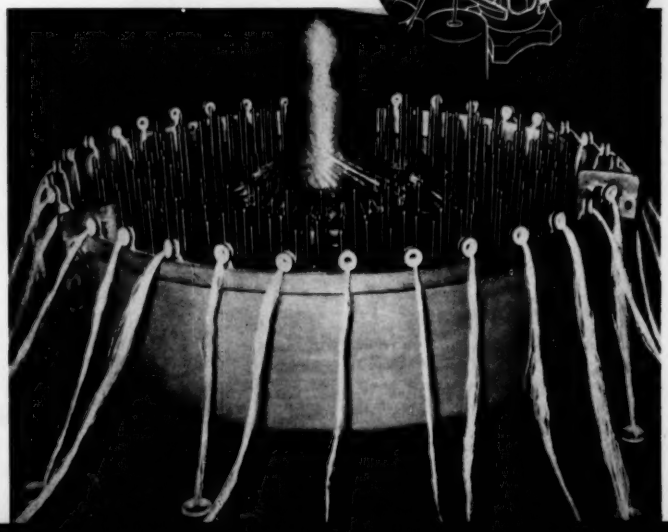


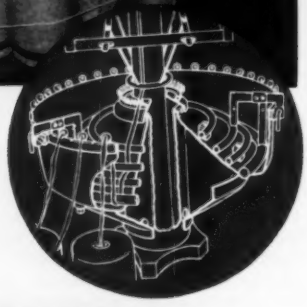
The length ab represents the circumference of the pipe and is equal to $2\pi r$.

ac represents the lay of the rovings at the angle α with a plane normal to the axis of the pipe and com-



Spiral wrapping of resin coated glass rovings is applied at Table 2. Cut-away drawing of resin tank and guides for rovings is at right





After another spiral of rovings is applied at Table 3 (identical with Table 2 shown at bottom of page 97 but rotating in opposite direction), a layer of parallel rovings is placed at Table 4, above. Cut-away view of resin tank and rovings guides is at right

pleting one revolution of the pipe and is equal to $\frac{2\pi r}{\cos \alpha}$.

bc is the length of pipe per revolution of a roving and is equal to $\frac{2\pi r}{\cos \alpha} \sin \alpha$,

r = the radius of the pipe in inches.

α = the angle of the spiral roving with a plane normal to the axis of the pipe.

N = the number of rovings used spirally in the pipe.

M = the ratio of the number of $\frac{\text{spiral rovings}}{\text{lengthwise rovings}}$.

Therefore,

$\frac{N}{M}$ = the number of lengthwise rovings.

S = the stress per roving of 60 ends of 204 filaments each.

P = pressure in the pipe in lb./sq. in. or p.s.i.

The circumferential stress in the wall of a one in. length of pipe is therefore Pr and

$$Pr = \frac{N S \cos \alpha}{\frac{2\pi r}{\cos \alpha} \sin \alpha} = \frac{N S \cos^2 \alpha}{2\pi r \sin \alpha}$$

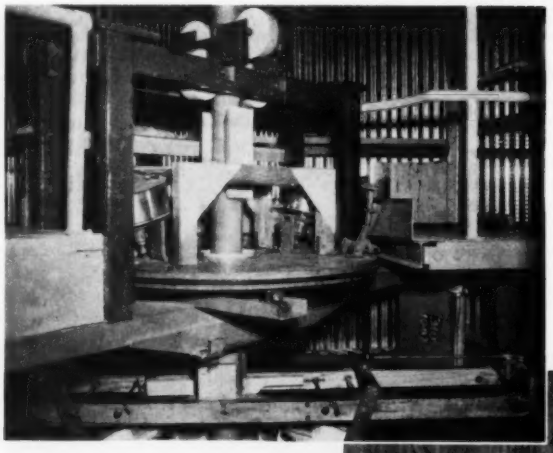
then

$$P = \frac{N S \cos^2 \alpha}{2\pi r^2 \sin \alpha}$$

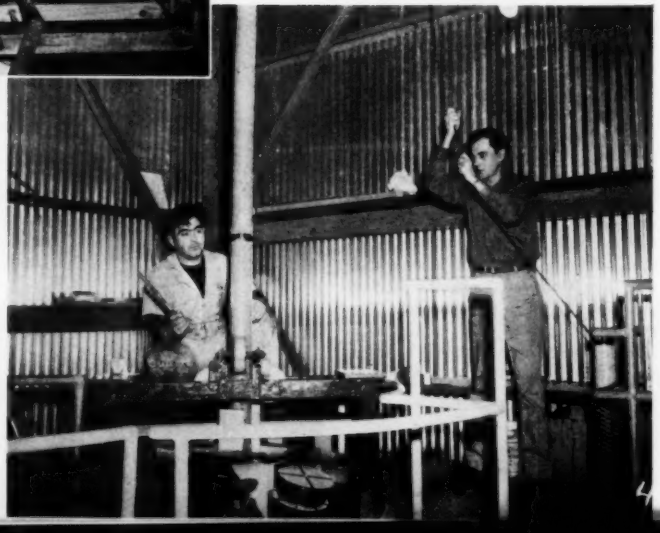
The total stress lengthwise in the wall of the pipe is the pressure times the cross sectional area of the pipe and equals $P\pi r^2$. This stress is resisted by the stress in the lengthwise rovings plus the lengthwise component of the stress in the spiral rovings.

Then,

(*Continued on p. 100*)

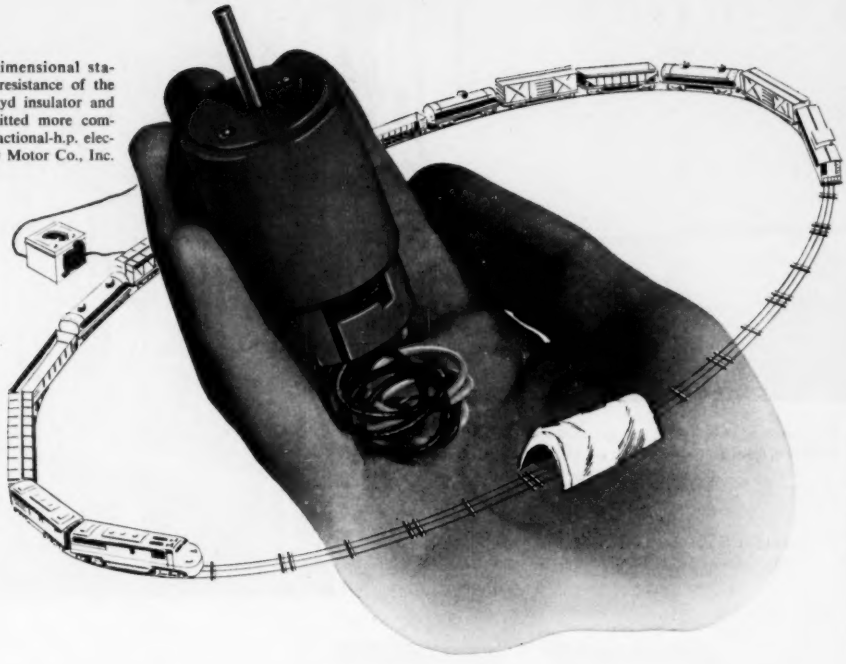


Uncoated glass tape spirals are wound on at Table 5. Then, at Table 6 (above), wooden paddles wipe off squeezed-out excess resin and a wrap of cellophane is applied



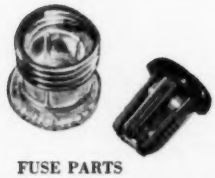
Above Table 6, pipe passes through a set of centering rolls. (See also photo above.) After about 21 ft. of pipe extends above rolls, the layup is cut between mandrels

The near-perfect dimensional stability and high arc resistance of the molded Plaskon Alkyd insulator and mounting case permitted more compact design in this fractional-h.p. electric motor by El Ray Motor Co., Inc.

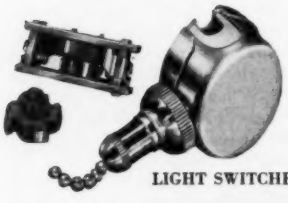


Design more compact electrical assemblies!

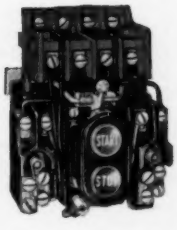
Look into the advantages of superior dielectric strength and high dimensional stability of molded Plaskon Alkyd!



FUSE PARTS



LIGHT SWITCHES



MOTOR STARTERS

Here's an example of how the exceptional insulating properties of parts molded of Plaskon Alkyd have made outstanding improvements in a wide number of products. Plaskon Alkyd has exceptional dimensional stability. You can design parts to precise specifications. Moldings have been held to tolerances as close as .0002".

The superior arc resistance of Plaskon Alkyd gives you an extra margin of safety. This permits you to design more compact electrical assemblies by incorporating smaller clearances and reduced over-all dimensions. Furthermore, parts endure unusual temperature ranges with no tendency to arc or rupture. You can make greater savings with Plaskon Alkyd, too. Faster molding at reduced pressures means greater productivity per mold cavity.

If you mold parts for motors, starters, meters, switches or any products demanding superior electrical properties, learn how you can use Plaskon Alkyd to improve your products and profits. Write Dept. M-62 for further information.

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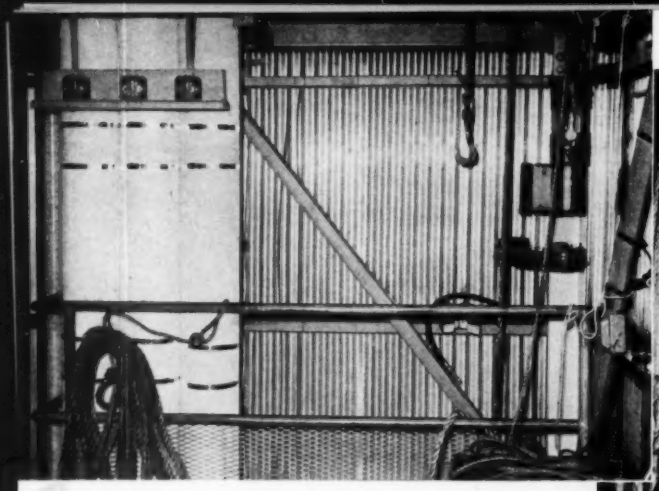


Upper ends of three curing pots are shown at left above. For location of these pots in production set-up, see drawing page 95

Mandrel is stripped from cured pipe (right), cleaned, coated with release agent, and is ready to start production again

$$P\pi r^2 = \frac{N}{M} S + N S \sin \alpha$$

or $$P = \frac{\frac{N}{M} S + N S \sin \alpha}{\pi r^2}$$

The pressure of course is the same whether acting lengthwise or circumferentially. Then,

$$\frac{N S \cos^2 \alpha}{2\pi r^2 \sin \alpha} = \frac{\frac{N}{M} S + N S \sin \alpha}{\pi r^2}$$

or $$\frac{\cos^2 \alpha}{2 \sin \alpha} = \frac{1}{M} + \sin \alpha$$

or $$(1 - \sin^2 \alpha) = \frac{2}{M} \sin \alpha + 2 \sin^2 \alpha$$

or $$3 \sin^2 \alpha + \frac{2}{M} \sin \alpha - 1 = 0$$

If the stress in the lengthwise and the spiral roving is to remain the same, the above equation must be satisfied. Solving this equation for various values of M gives the angle α at which the spiral roving should be laid to give equal stress in the lengthwise and spiral roving. (See table preceding column.)

M	$\sin \alpha$	α
½	.2153	12.44°
1	.3333	19.47°
2	.4343	25.73°
3	.4769	28.48°
4	.5000	30.00°
5	.5154	31.00°
10	.5450	33.03°
20	.5525	33.54°
100	.5770	35.24°
∞	.5770	35.26°

It is of course also necessary that the stretch in the pipe due to pressure be the same as applied to the lengthwise rovings as to the spiral rovings:

Let $\triangle L$ = stretch in the pipe due to pressure.

A = cross sectional area of one roving of 60 ends of 204 filaments each and equals 0.0013 sq. inches.

Y = Young's modulus for the glass and by tests of rovings in plastics is about

$$10.5 \times 10^6 \frac{\text{lb./sq. in.}}{\text{in./in.}}$$

The lengthwise stretch in a 20 ft. pipe where the pressure is such that a stress S in lb./roving is applied to the glass from lengthwise roving is:

$$\triangle L = \frac{240\ S}{A\ Y}$$

The same stretch from the spiral rovings is:

$$\triangle L = \left(\frac{S}{A\ Y}\right)\left(\frac{240}{\sin \alpha}\right)(\sin \alpha) = \frac{240\ S}{A\ Y}$$

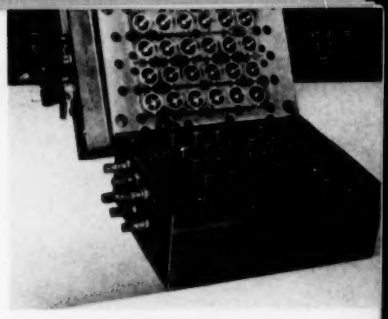
and it is clear that the stretch in the pipe from both the lengthwise rovings and the spiral rovings is the same.

Similarly, it can be shown that if it is desired to have the lengthwise strength of the pipe half again as great as the circumferential strength, when M = 1, the angle should be 25.38°. If it is desired to have the lengthwise strength of the pipe twice the circumferential strength, when M = 1, the angle should be 30°. It is obvious, of course, that, by changing the ratio M, the pipe can be designed to meet the required burst pressure, and in addition, a required beam strength. Therefore, a pipe which is made by this process can be stress analysed and can be designed to meet almost any of the required conditions.

Since the process is continuous and is not held up by curing, which is a separate operation, it has the advantage of an extremely high rate of production, limited only by how fast the tables can be turned and their capacity for holding Fiberglas. This, coupled with the automatic character of the machine which requires a very small crew, provides high production rate at very low cost.

Hot Runner Molds

Tapered closures to be used as plugs or caps are made in a specially designed mold in order to achieve mass production on an economical basis



Multi-cavity hot runner mold of type described in the accompanying article

PRODUCED in unusual multi-cavity molds, a dual-purpose injection molded closure recently placed on the market serves as a moisture seal and shipping protector for threads, pipe and tubing ends, etc. This closure, injection molded of polyethylene, is a cap, without threads, having tapered walls. Because of this design, standard sizes of closures will fit a wide range of diameters as an outside cap or an inside plug. Known as CaPlugs,* these closures are used for masking for paint spraying where high temperature baking ovens are not involved; to keep liquid plastics from entering internal parts of articles which are being dip-coated; to protect tubing, fittings, valves, automotive parts, and many other items in shipping. They are produced in standard sizes to fit inside or outside diameters, threaded to plain, from ⅛ to 1½ in., with special sizes available up to 3½ in. diameter.

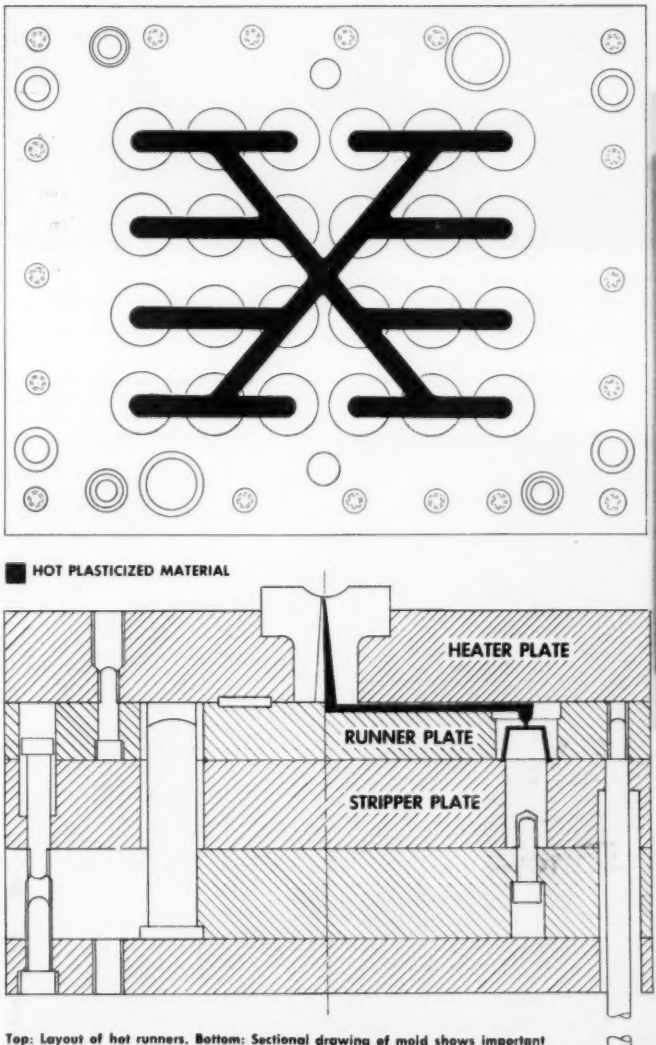
Inasmuch as these are throw-away items, it is necessary that they be produced and sold at a low cost. In fact, many of the sizes are sold for less than $5.00 per thousand.

Design Proved

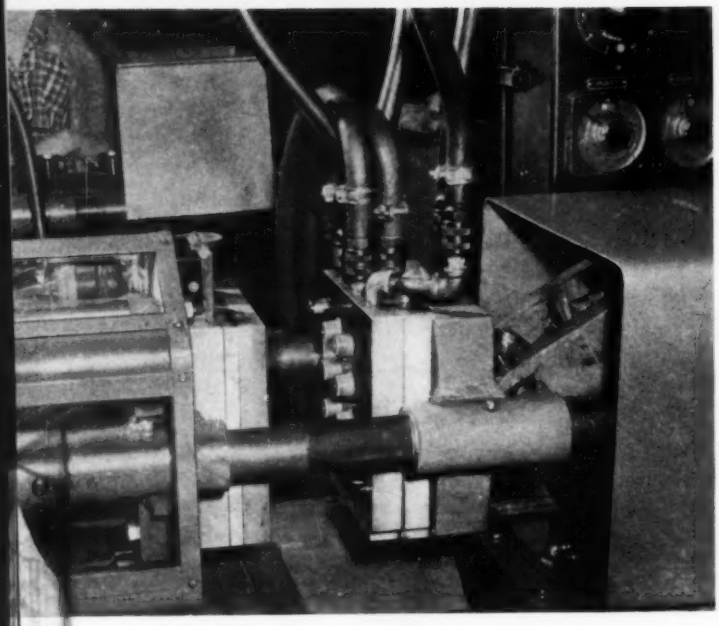
These closures were first developed through the use of simple wooden molds into which melted polyethylene was poured. Then sample metal injection molds were produced and parts were run by Hake Mfg. Co., Inc., Depew, N.Y. As stated by J. R. Grenier and E. W. Dormeyer of CaPlugs Div., Protective Closures Co., Inc., Buffalo, N.Y., the favorable acceptance of the closures by industry after but a brief sampling proved that there was a wide market for the product.

In order to get the additional pro-

* U.S. Patent No. 2,580,762



Top: Layout of hot runners. Bottom: Sectional drawing of mold shows important elements, including the method of gating and use of stripper plate for ejection



Piping arrangement for circulating coolant through force side of a hot runner mold. Use of coolant is necessitated by high heat transfer rate between hot and cold halves

Thermometer and electrical connections (center foreground) are mounted on hot cavity half of mold. Heating elements in this half keep material in runners in plastic state

duction, Protective Closures Co. undertook the molding of at least a portion of their own requirements. They decided that several small machines would fit in with their production scheme more economically than one large one; however, one difficulty presented itself. The projected area of the parts themselves was small compared to the area required by the runners in the mold. Because of the economics of the situation, it was mandatory that as many cavities as possible be run in one mold. Accordingly, the company decided to investigate a hot runner mold for the operation, simply because with the use of this type of mold, only the clamping capacity required for the molded parts themselves is required; the area of runners does not have to be taken into consideration.

In a hot runner mold, the gate half of the mold is composed of two separate plates known as the heater plate and the runner plate. These two components are bolted together. The heater plate is equipped with electrical heating elements located in such a manner that the over-all temperature of the plates is as uniform as possible. Thermostatic control maintains both the runner plate and the heater plate at a temperature which is sufficient to keep the thermoplastic material in the runners in as plastic a state as it is when it leaves the injection nozzle.

No Runner Scrap

An additional factor in favor of a hot runner mold was that there would be no runner scrap to regrind. The problem of designing this type of mold was complicated by the fact that, for most CaPlug sizes, it is not practical to have less than 20 cavities, and that all of the cavities must be filled at the same time. This latter requirement is necessary in order to minimize temperature variations caused by excessive time of contact between the hot and cold sides of the mold. Such variations would increase the over-all cycle and at the same time would tend to produce poorer quality molded parts. In a hot runner type of mold, the size and shape of the runners as well as the diameter of the gates must be so engineered that the softened material will flow evenly and simultaneously into each cavity.

With all these considerations in

mind, a mold was designed and constructed after consultation with Van Dorn Iron Works Co., Cleveland, Ohio, and was given a try-out run in a Van Dorn injection machine. Although the results were not completely satisfactory, there was every indication that the mold could be made to work after certain changes in design had been made.

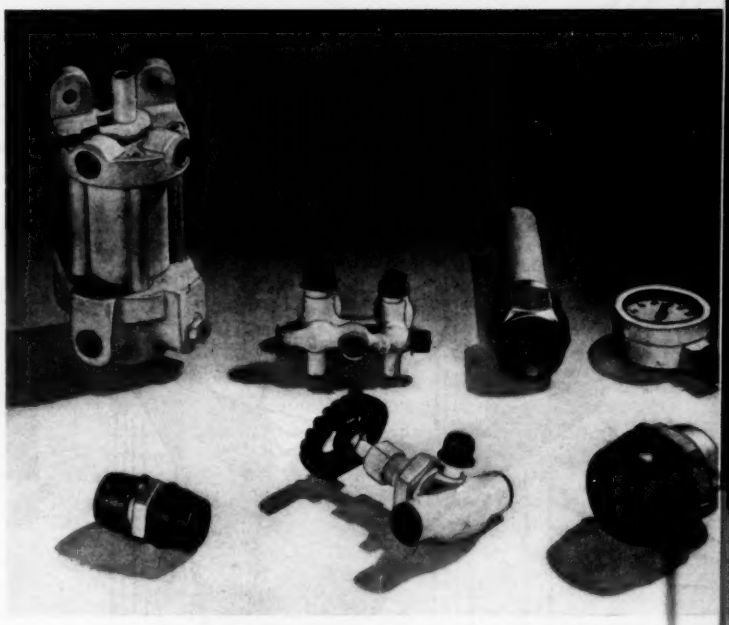
One of the first problems that had to be overcome had to do with strengthening the assembly of the heater plate and the runner plate. Four bolts were used for this purpose in the first mold. When the first shot was taken, these four bolts snapped, and the hot plate and runner plate fell apart. This indicated the terrific pressure which was exerted because of the projected area of the runners. The plan view of the mold drawing shows the number of bolts which were finally required to be used as a means to overcoming this pressure.

Additional mold changes had to do with rearranging the electric heating elements between the runner plate and heater plate, so that the over-all temperature would be more uniform; and experimenting with the gate sizes so that all cavities would fill at the same time. This development work required about a month after a new Van Dorn machine had been delivered to Protective Closures in Buffalo. Since that time, three additional machine have been put into production and more are on order.

Refrigeration Needed

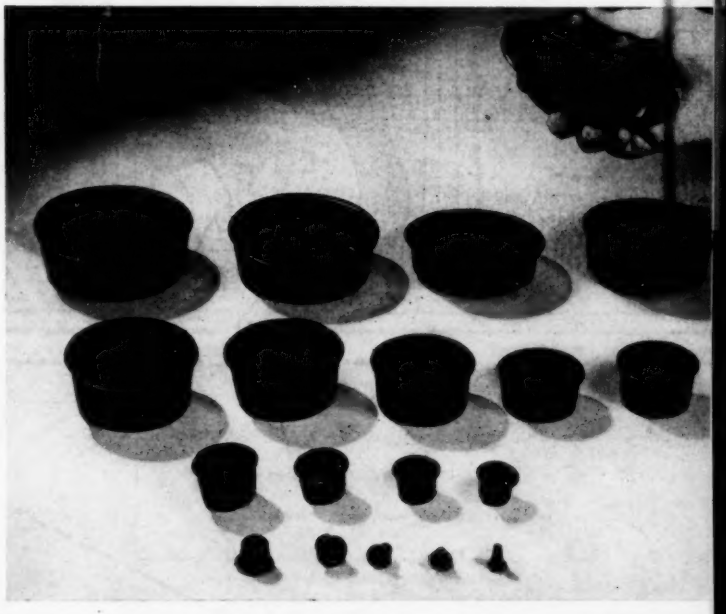
Because of the high rate of heat transfer between the hot cavity side of the mold and the cold force plug side of the mold, it was found that a circulating medium colder than tap water was required on the force plug side in order to cool the polyethylene quickly enough to obtain a fast molding cycle. Eventually a complete refrigeration and circulating system was built, in which an ethylene-glycol solution is maintained below 32° F. With this low-temperature cooling medium on the force plug side of the mold, cycles better than four shots per min. are maintained.

Since completion of the initial experimental work, Protective Closures Co. has built many additional molds for the various different sizes of CaPlugs.

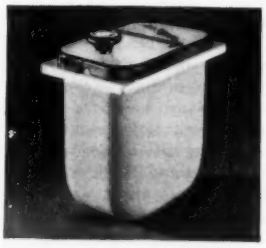


Typical examples of uses for tapered closures which can be applied as either plugs or caps, to threaded or unthreaded openings. These closures, produced of polyethylene in hot runner molds, provide protection during paint spraying, dip coating, shipment, etc.

Molded protective closures are produced in a wide range of standard and special sizes. Because they are made of polyethylene, the closures are tough yet they are so flexible that they are applied by simply pushing them onto or into openings to be protected



Silex Coffeemakers have covers of MELMAC; *handles and tray are of* BEETLE *urea; made by The Silex Co.*



Kenco crushed fruit jar molded of MELMAC; *Kenco Products Corp.*

MELMAC cap for Electric Auto-Lite Company distributors, manufactured for jeeps and trucks.

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Here are a few of the hard-hitting, sales-compelling advantages you put into your product when you mold it of MELMAC:

RESISTANCE TO IMPACT, ABRASION AND WEAR. MELMAC has the hardest, most durable surface of any plastic material. Its phenomenal resistance to breaking, chipping and cracking has been proven in such applications as lighting reflectors, tableware, containers and housings for household appliances.

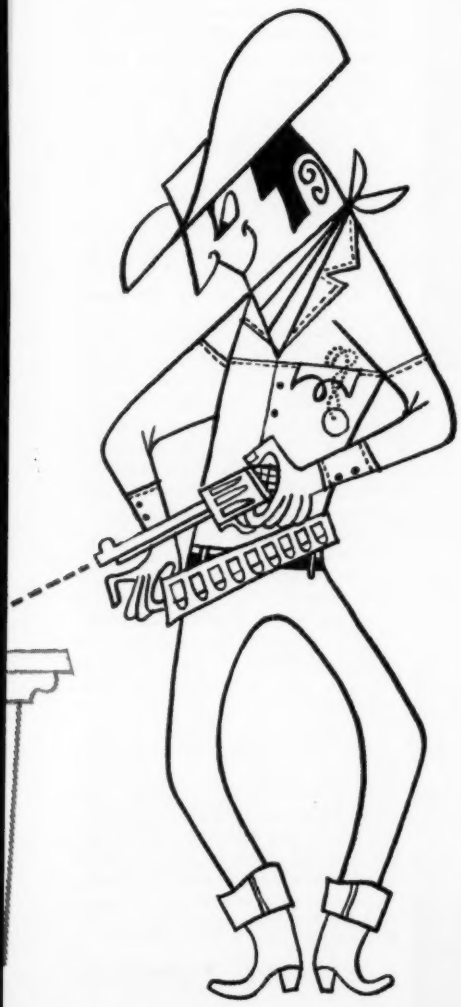
PERMANENT COLOR. MELMAC provides a wide range of *molded-in colors* that save you the cost of color application and won't fade, crack, chip, flake or peel.

LIGHTER WEIGHT. MELMAC is light in weight, yet has the solid substantial "feel" of much heavier materials. This, together with its lustrous color and break-resistance, is "proving out" in sales of coffee percolators, fountain equipment and kitchen ware.

BETTER CORROSION RESISTANCE. MELMAC is unaffected by common solvents, greases, oils, weak acids and alkalies, salt water and perspiration.

BETTER ELECTRICAL PROPERTIES. MELMAC has extremely high dielectric strength and arc-resistant properties that minimize hazards from short circuiting and fire—a proven record of outstanding performance in ignition parts for automotive and aircraft equipment, terminal blocks, circuit breakers, electric motor insulation.

If you want a material that offers all these advantages, yet can be molded into almost any shape and is easy to handle and ship, MELMAC is your material!



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PLASTICS DEPARTMENT

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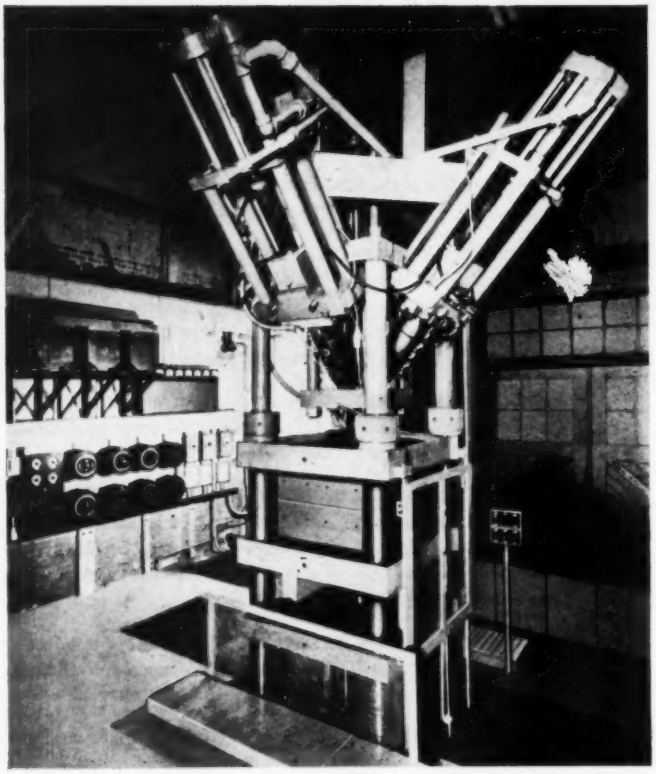
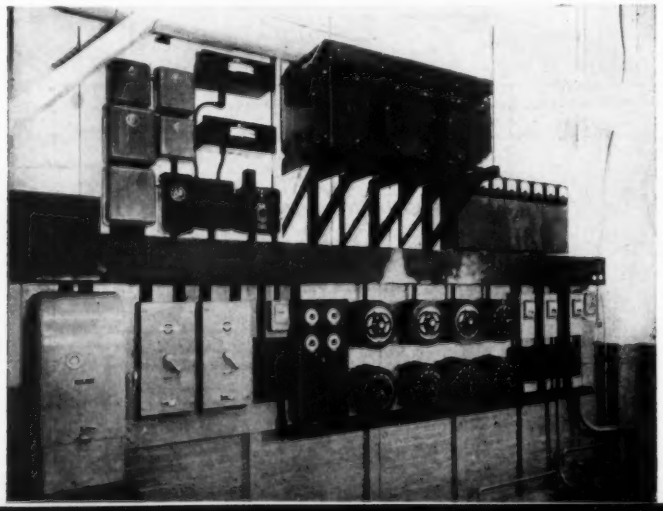
Four Pre-Plasticizers in One



Three-story vertical injection molding machine employs four pre-plasticizers feeding into one injection chamber and is claimed to have rated capacity of 375 oz. polystyrene

Electrical controls are grouped beside machine; each pre-plasticizer has 3 separate heating zones controlled by separate Variacs, one pyrometer controller for each cylinder



AFTER over three years of development during which three smaller machines were built and tested, Worcester Molded Plastics Co., Worcester, Mass., decided to construct an injection machine which, it is claimed, has a greater injection capacity than any other machine in operation today. This machine, when arranged to operate at top capacity, makes use of four pre-plasticizers feeding into one injection chamber. Operating in this manner it is claimed that this machine has a rated capacity of 375 oz. of polystyrene.

It is a vertical type machine with a clamping mechanism in a deep pit; the platens, injection cylinder, and pre-plasticizers on the first floor; and the material hopper and feed mechanism on the second floor. It is so arranged, however, that an operator standing on the floor level of the first floor has easy access to the open mold platens, thus making the removal of the molded parts a very simple matter.

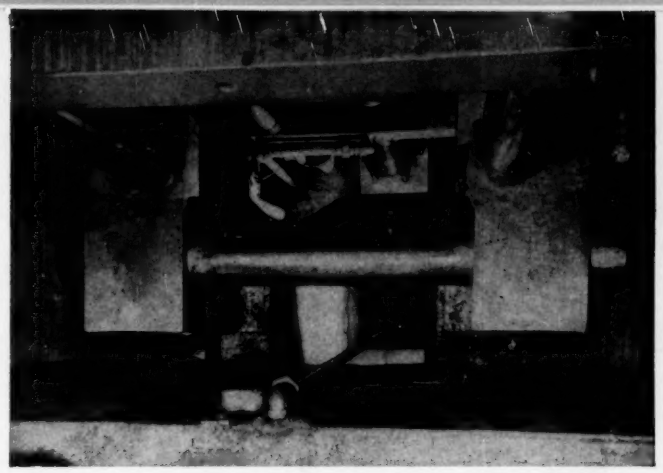
The mold clamp of this machine is a hydraulically actuated toggle type, engineered and developed by Philip J. Graham, president of Worcester Molded. It has a maximum clamping capacity of 2000 tons and, because of the long travel available, a maximum daylight opening of 82 in. between platens can be obtained. The closing speed of this clamp is so fast that only 4 sec. is required for the full 41 in. travel of the clamp, even including the time required by the slow-down feature which is used to eliminate the slamming of the molds as they close.

The injection and pre-plasticizer setup permits the operation of but two pre-plasticizers when the maximum capacity of the machine is not required. When two pre-plasticizers are in use, an injection chamber measuring 5 in. in diameter by 17 in. long is assembled onto the machine. When all four pre-plasticizers are used, however, a 7 in. diameter cylinder 17 in. long is required. With two pre-plasticizers and the smaller injection chamber, the machine has a capacity of 165 oz. of styrene, as against the maximum of 375 oz. when the four pre-plasticizers and larger injection cylinder are used.

The capacity of each pre-plasticizing cylinder was intentionally designed over-size; that is, with more plasticizing capacity than actually required to fill the injection cylinder. Accordingly, each pre-plasticizer has a capacity of 113 oz. of polystyrene per stroke, and will plasticize this amount of material in approximately 1 minute. The hopper on the third floor will hold 850 lb. of material, and is designed so that the one hopper will feed through four different vertical chutes into the four pre-plasticizing chambers.

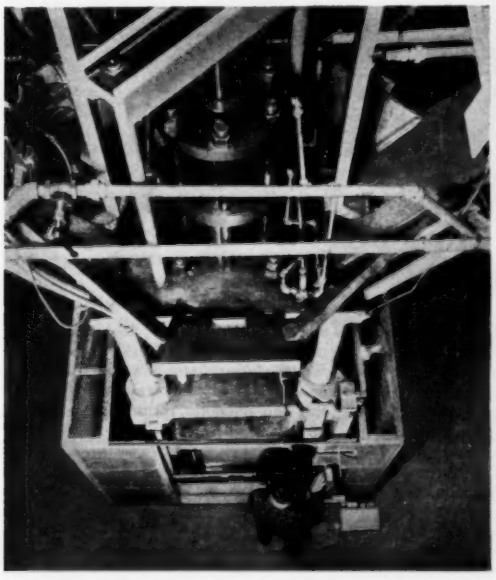
Only 50 hp. is required for the hydraulic operation of this machine. Although Vickers pumps are used, the balance of the hydraulic system and controls were Worcester designed. The heat demand for the four pre-plasticizers requires nearly 100 kw. of power.

Each pre-plasticizer has three separate heating zones, each of them controlled by a separate Variac, with one pyrometer controller for each cylinder. The electrical hookup on each cylinder is such that the on and off action of the pyrometer only cuts off a portion of the heating elements. Mr. Graham claims that with this type of setup his temperature control is much closer than if he depended upon the pyrometer controller alone.

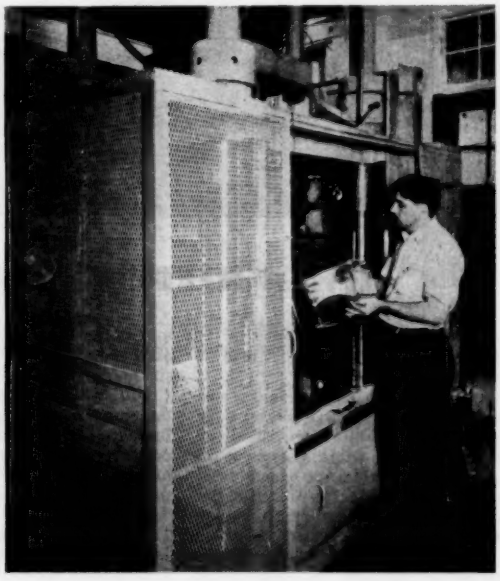


View from the first or working floor, where easy access to the open mold platens is provided for the operator, looking down into the pit which houses clamping mechanism

At the present time, a one-piece styrene battery case weighing 8 lb. and measuring approximately 16 in. high by 13 in. square is being successfully molded on this machine. A two-cavity mold is under construction for a silverware chest. This chest will weigh somewhat over 4 lb. and will measure 24 in. long by 14 in. wide by 4 in. deep. Development work is now going forward on a very large acrylic part to be used in the lighting field. This part will weigh approximately 14 pounds. In addition to these developments, work is also being done on a complete inner liner for a refrigerator. The material with which such a piece would be molded would probably be high-impact styrene.



Size of machine is evidenced by this view of operating floor from the second floor, where material hopper and feed mechanism are located



One-piece styrene battery case, weighing 8 lb. and measuring about 16 in. high by 13 in. sq., is removed from the mold by an operator

WHEN NEEDED . . . a specialist!

No machine has ever been invented to take over this job. Here, a man is needed—a specialist.

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Properties of Polymethyl Alpha-Chloroacrylate

by M. C. SLONE, J. J. LAMB, and F. W. REINHART[1]

Polymethyl alpha-chloracrylate is superior to heat-resistant acrylic plastic in tensile and flexural strength properties, hardness, heat resistance, and crazing resistance. It is inferior in resistance to weathering and has a higher specific gravity. In other properties the two are not appreciably different. Tensile and impact strengths are slightly higher than those reported in the literature[2] for PMCA of British manufacture.

METHYL methacrylate transparent plastic sheet is the principal material now used in aircraft glazing. While this plastic possesses the desirable properties of high strength, ease of formability and cutting, excellent resistance to weathering, and lightness in weight, it lacks the desirable properties of resistance to heat, crazing, abrasion, and scratching. A new transparent plastic material, polymethyl alpha-chloroacrylate, is reported to be superior to polymethyl methacrylate in these latter properties without appreciably affecting adversely other desirable properties.

The properties of polymethyl alpha-chloroacrylate needed to evaluate this new material for use in aircraft glazing have been determined by the National Bureau of Standards at the request of the Department of the Air Force. The results of this evaluation are presented in this report.

Materials and Sampling

The polymethyl alpha-chloroacrylate (PMCA) used in this investigation was supplied by the Department of the Air Force in the form of six sheets, each approximately 2 ft. square (Table I). Three sheets had a nominal thickness of ⅛ in. and the other three ¼ inch. Each sheet of PMCA was divided into quarters. For each test, at least one specimen was taken from each of the three sheets of the appropriate thickness. Wherever more than one specimen from a sheet was used, they were generally taken from two opposite quadrants of the sheet. In a few cases, specimens were selected at random from each sheet.

Two sheets of the heat-resistant grade of methyl methacrylate plastic (Plexiglas II) were obtained for comparative tests. These sheets were 3 x 4 ft.; one had a nominal thickness of ⅛ in. and the other of ¼ inch. The specimens of Plexiglas II for each test were taken adjacent to one another from one location in the sheet. The variations in this material are sufficiently known so that extensive sampling and testing were not necessary.

All the test specimens were conditioned at 23°C. and 50% relative humidity for at least 96 hr. prior to test and tested at these conditions unless otherwise specified in the individual description of the test.

Tensile Properties

The tensile tests were made in accordance with Method 1011 of Federal Specification L-P-406a. All tests were made on a 60,000-lb. hydraulic testing machine using the 2400-lb. range. The rate of strain was maintained at 0.05 in./min.

Table II and Fig. 1 give the results of the tensile tests. The PMCA specimens broke at all temperatures at the maximum stress. The Plexiglas II specimens at 50°C. and 70°C. reached a maximum stress, after which the stress decreased. At -55°C.

Table I—Description of Polymethyl Alpha-Chloroacrylate Sheets

NBS sheet designation	*Nominal thickness*	*Polymerization conditions*[a]		
		Exposure to ultraviolet	*Exposure to heat*	
	in.	*hr.*	*hr.*	*°C.*
A	¼	17	20½	126
B	¼	18¾	19¾	124–127
C	¼	23¾	20	126
D	⅛	20	19	125
E	⅛	15	19	125
F	⅛	16	21	124–126

[a] Information supplied by the manufacturer, General Aniline and Film Corp.; their trade name for this plastic is Gafite.

* Reg.U.S. Pat. Office
[1] Organic Plastics Sec., Nat'l. Bureau of Standards.
[2] British Plastics *23*, 147 (Nov. 1950).

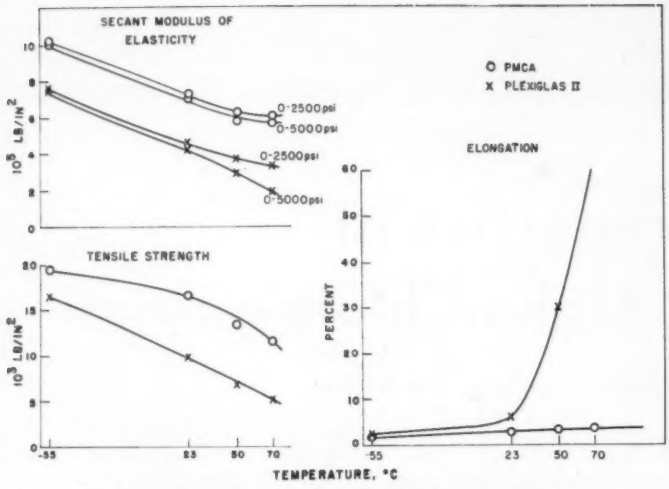

Fig. 1—Tensile properties of polymethyl alpha-chloroacrylate, (PMCA)

and 23°C., however, the Plexiglas II specimens also broke at maximum stress. The British PMCA was reported[2] to have a tensile strength of 11,000 to 12,000 p.s.i. at 20°C. and 8000 to 9000 p.s.i. at 75°C., and a modulus of elasticity of 750,000 p.s.i. at 20°C. and 530,000 p.s.i. at 75°C.

The notch sensitivity specimen was prepared by drilling a ⅛-in.-diameter hole at the center of the tensile specimen. The test was then conducted as a standard tensile test. The results were calculated using the actual cross-sectional area of the drilled test specimen, which was about 75% of the original tensile specimen area. The results of this test are given in Table II.

The point at which crazing initially occurs on a material in tension was measured in conjunction with the tensile tests. While testing the specimens of both materials at 23°C., visual observation of the crazing threshold was noted and marked on the stress-strain curve. Average values obtained are given in Table II.

A comparison of the ratio of tensile stress at crazing to that at rupture shows that for both materials the ratios are very similar. For PMCA the ratio is 0.81, while for the Plexiglas II the ratio is 0.89. For strain, however, such agreement is not observed because of the large amount of strain occurring in the Plexiglas II during the latter stages of the test.

No significant differences in the tensile properties of the various sheets of PMCA were noted.

Flexural Properties

The flexural tests were made in accordance with Method 1031 of Federal Specification L-P-406a. The tests at 23°C. were made on a 2400-lb. hydraulic testing machine using a 1200-lb. range. The tests at −55°C., 50°C., and 70°C. were conducted on a similar machine of 60,000-lb. maximum capacity using a 240-lb. range. The ratio of strain in all cases was 0.10 in./min. The tests at 23°, 50°, and 70°C. were conducted with a span-depth ratio of 16:1. The operation of the flexure jig screws, which set the span dimension exactly, was difficult at −55°C., and a constant span of 4.0 in. was used at that temperature.

The results of the flexure test data are shown in Table III and Fig. 2. The deflection of the Plexiglas II at 50° and 70°C. was so great that it did not break within the gage limits. In the tests at −55°C., because the span-depth ratio is greater than 16:1, a higher deflection is obtained than would normally be encountered if the ratio were 16:1 as in the other tests. For the Plexiglas II specimens the span-depth ratio varied from 16.8:1 to 16.9:1 and for the PMCA the span-depth ratio varied from 16.4:1 to 19.8:1.

No significant differences in the flexural properties of the various

Table II—Tensile Properties[a] of Polymethyl Alpha-Chloroacrylate (PMCA)

		PMCA		Plexiglas II	
Property	*Temp.*	*Average*	*Std. dev.*	*Average*	*Std. dev.*
	°C.				
Tensile strength, 10^3 p.s.i.	−55	19.5	1.0	16.6	1.0
	23	16.6	0.7	9.8	0.07
	50	13.3	0.7	6.7	0.1
	70	11.6	0.4	5.1	0.03
Secant modulus of elasticity, 0–2500 p.s.i. range, 10^5 p.s.i.	−55	10.2	0.7	7.5	0.9
	23	7.3	0.4	4.6	0.2
	50	6.3	1.0	3.7	0.3
	70	6.1	0.6	3.3	0.3
Secant modulus of elasticity, 0–5000 p.s.i. range, 10^5 p.s.i.	−55	10.0	0.7	7.4	0.7
	23	7.0	0.2	4.2	0.1
	50	5.8	0.6	2.9	0.1
	70	5.7	0.5	1.9	0.04
Elongation at rupture, % of original length	−55	1.9	0.4	2.6	0.7
	23	3.0	0.4	6.4	0.8
	50	3.4	0.5	32[b]	24.
	70	3.8	0.6	>67[c]	—
Notch sensitivity, 10^3 p.s.i.	23	9.8	0.5	6.6	3.0
Crazing threshold					
Stress, 10^3 p.s.i.	23	13.2	0.4	8.7	0.3
Strain, %	23	2.2	0.1	2.9	0.2

[a] Five or six specimens were used to obtain the average values and standard deviations reported. [b] One specimen broke after the range of the gage was exceeded. For the calculation of the average value and standard deviation, a value of 70% elongation was used for this specimen, based on the time required to break. [c] Did not break.

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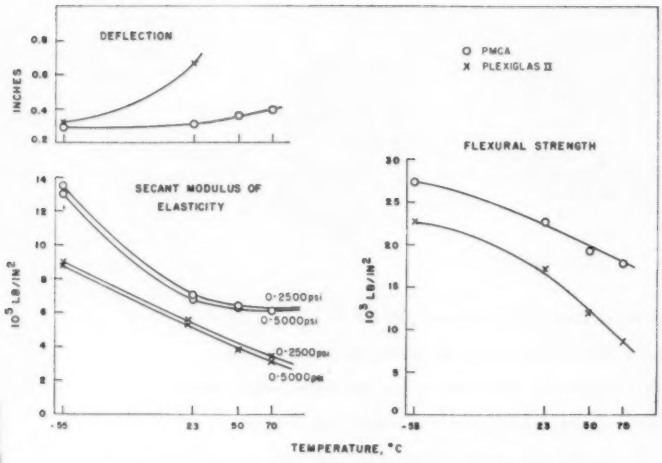

Fig. 2—Flexural properties of polymethyl alpha-chloroacrylate, (PMCA)

sheets of PMCA which were tested were noted.

Impact Strength

The impact strength of the materials was measured in accordance with Method 1071 of Federal Specification L-P-406a. Tests were made on both notched and unnotched specimens prepared from the ¼-in.-thick sheets. No difference was observed in the strength values of the various PMCA sheets. Table IV shows that the test temperature does not greatly affect the impact strength. The different test groups do not show any definite temperature-strength relationship, although in most cases the impact strength decreased at higher temperatures. The British PMCA was reported[2] to have an Izod impact strength of 0.3 ft.-lb./in. of notch at 20°C.

Indentation Hardness

Rockwell—The Rockwell indentation hardness test was made in accordance with Method 1081.1 of Federal Specification L-P-406a. The PMCA had an average hardness of M115, which, according to the test method, is the limit for the M scale. Therefore, a second test was made on the same PMCA specimens on the E scale. The results of these tests are given in Table V.

Barcol—The Barcol hardness test consists of making an indentation in the material by a pointed rod mounted on a calibrated spring and connected to a gage reading from 0 to 100. When the indentation is first made, a reading is obtained on the gage. This is the maximum reading noted in Table V. Then as the material relaxes under load, the indenting pointer goes further into the material giving gradually lower readings on the gage. This second reaction occurs only in plastic materials and not in materials such as aluminum.

Three sets of readings were made on each sheet of PMCA and five on each of the Plexiglas II. The maximum (initial) reading was taken, and after 5 sec. a second gage reading was taken; 5 sec. was selected because by this time the reading on PMCA had dropped to a steady value. In testing the Plexiglas II, however, the values were still dropping slightly after 5 seconds.

The results of the test are given in Table V. The hardness of an aluminum disk supplied by the instrument manufacturer is 86.

Tukon—The Tukon hardness test measures the hardness of a material by pyramidal indentation. This indentation is made by a "Knoop" indenter having a definite size and shape and is pushed against the material by a constant load for a definite period of time. The hardness is calculated mathematically from measurements of the area of the unrecovered indentation and known values of area of the indenter and the load applied. The results are given in Table V.

Surface Abrasion

The abrasion resistance of the two materials was measured in accordance with Method 1082.1 of Federal Specification L-P-406a. The materials were abraded on a Taber Abraser, handling two specimens alternately, and optical measurements were made on the Hunter Hazemeter, which is an integrating sphere photometer. The three PMCA specimens were abraded for 75 rev-

Table III—Flexural Properties[a] of Polymethyl Alpha-Chloroacrylate (PMCA)

		PMCA		*Plexiglas II*	
Property	*Temp.*	*Average*	*Std. Dev.*	*Average*	*Std. Dev.*
	°C.				
Flexural strength, 10^3 p.s.i.	−55	27.4	1.1	22.7	0.5
	23	22.7	1.2	17.1	0.4
	50	19.3	1.4	11.8	0.1
	70	17.9	1.8	8.7	0.1
Secant modulus of elasticity,	−55	13.5	1.3	9.0	0.1
0–2500 p.s.i. range, 10^3 p.s.i.	23	7.0	0.8	5.6	1.1
	50	6.4	0.03	3.8	0.1
	70	6.1	0.2	3.4	0.1
Secant modulus of elasticity,	−55	13.0	1.2	8.8	0.1
0–5000 p.s.i. range, 10^3 p.s.i.	23	6.7	0.8	5.3	0.4
	50	6.3	0.1	3.8	0.05
	70	6.1	0.3	3.1	0.05
Deflection at rupture, in.	−55	0.29	0.04	0.32	0.03
	23	0.31	0.05	0.67	0.07
	50	0.36	0.05	—[b]	—
	70	0.39	0.07	—[b]	—

[a] Five or six specimens were used to obtain the average values and standard deviations reported.
[b] Did not break.

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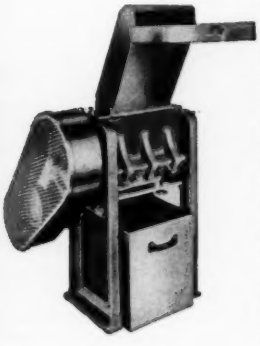	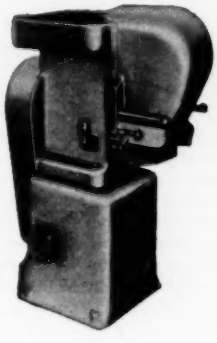	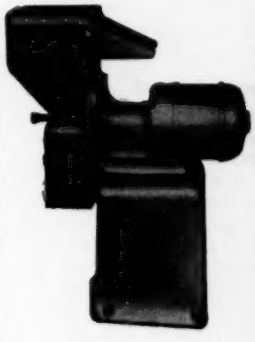
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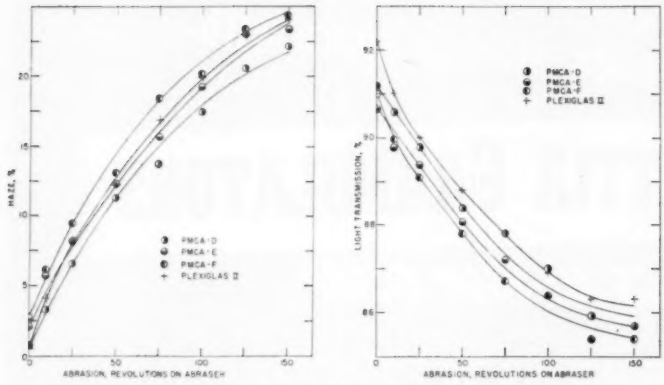

Fig. 3—Abrasion resistance of polymethyl alpha-chloroacrylate, (PMCA)

olutions before any abrasion of the Plexiglas II was started. The Plexiglas II was then abraded for 75 revolutions. All four specimens were then abraded in pairs selected at random with the restriction that all specimens were abraded the same number of revolutions.

Only one set of CS-10 wheels was used in all these tests. The results are shown in Fig. 3.

Deformation Under Load

The deformation under load was determined in accordance with Method 1101 of Federal Specification L-P-406a, at a temperature of 50°C. Each specimen was prepared by piling enough ½-in. squares from one sheet to form a cube approximately ½-in. thick. These PMCA cubes varied from 0.45 to 0.491 in. in thickness. One specimen of Plexiglas II was prepared from ⅛-in.-thick sheet. The thickness of this test block was 0.50 inch. The results of the test expressed as percent decrease of the original thickness under a load of 1000 lb. (4000 p.s.i.) for 24 hr. are as follows:

	Average	*Range*
	%	%
PMCA	0.14	0.10-0.20
Plexiglas II	0.89	—

In Method 1101 the original thickness is defined as the thickness after removal from the testing machine plus the deformation. The results here, however, are based on the original thickness as measured before testing. The three PMCA specimens made from the ¼-in.-thick sheets had a lower deformation than the specimens from the ⅛-in.-thick sheets with the two average values being 0.12% and 0.17%, respectively. This difference may be due to errors in the original thickness measurements, resulting from the necessity of using 2 pieces on top of one another for the ¼-in.-thick material and also of using 4 pieces for the ⅛-in.-thick material.

Heat Distortion Temperature

The heat distortion temperature was determined in accordance with Method 2011.1 of Federal Specification L-P-406a. The results of this test are given in Table VI and are expressed as the temperature, in °C., at which a deflection of 0.01 in. occurred under a stress of 264 p.s.i. There did not seem to be any systematic variation among the three PMCA sheets. Sheet A had the highest average value and sheet C the lowest, but the differences were within the experimental error.

Figure 4 is a graphical representation, according to Method 2011.1, of the heat distortion data showing the

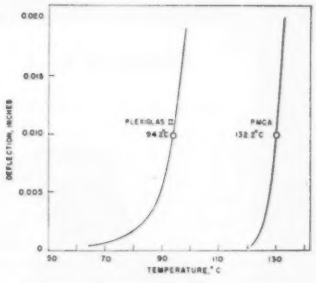

Fig. 4—Heat distortion of polymethyl alpha-chloroacrylate, (PMCA)

behavior of the two materials with increasing temperature. The PMCA remains rigid to within a few degrees of its heat distortion value and then deflects very rapidly. The Plexiglas II deflects more gradually and at a lower relative temperature than the PMCA; it also begins to deflect more rapidly but not as sharply as the PMCA near its heat distortion temperature. The British PMCA was reported[2] to have a heat distortion temperature of 130° to 140°C.

Flammability

The test for flammability was made in accordance with Method 2021 of Federal Specification L-P-406a. Results are in Table VI. PMCA was not only self-extinguishing, but flame extinguished immediately after external burner was removed.

Ignition Characteristics

The relative ignition characteristics were determined by Setchkin's

Table IV—Izod Impact Strength[a] of Polymethyl Alpha-Chloroacrylate (PMCA)

Test specimens	*Temp.*	*PMCA Impact strength*		*Plexiglas II Impact strength*	
		Average	*Std. dev.*	*Average*	*Std. dev.*
	°C.	*ft.-lb./in.*	*ft.-lb./in.*	*ft.-lb./in.*	*ft.-lb./in.*
Notched	−55	0.42	0.03	0.41	0.04
	23	0.41	0.02	0.45	0.03
	50	0.34	0.01	0.40	0.05
	70	0.34	0.04	0.39	0.02
Unnotched	−55	5.21	0.44	4.86	0.22
	23	5.43	0.27	5.13	0.25
	50	4.57	0.42	4.93	0.41
	70	4.59	0.20	5.26	0.53

[a] Seven to thirteen specimens were used to obtain the average values and standard deviations reported.

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method. This method consists of suspending the plastic material in a small constant-temperature oven through which heated air is continually passing. The heated air and gas from the specimen is vented through a small port at the top of the furnace. If desired, a pilot flame may be kept at the exit port to determine the combustion properties of the exit gas mixture. The test results are summarized in Table VI.

Polymethyl alpha-chloroacrylate heated to a temperature of 200°C. developed an appreciable amount of smoke and combustible gases. As the temperature was raised, the gases generated ignited at 232°C. This temperature is called the flash temperature. With increasing temperature, the material expands considerably with the formation of a white spongy mass having the appearance of sugar. Without the pilot flame, this mass carbonizes with generation of heat. At an air temperature of 412°C., the carbonized mass self-heated to 550° to 600°C. and reached a state of glow. This temperature is the self-ignition glow temperature. At 452°C. and above, the combustible gases developed from the material are self-ignited with a very dull flame spread throughout the entire furnace. The lowest results were obtained at an air velocity around the specimen of about 2 ft./min. or with natural circulation of air within the furnace.

The Plexiglas II began to bubble and melt in the range of 200°C. The flash temperature was 282°C. The material remained in a liquid state and showed very little self-heating before reaching its self-ignition flame temperature of 449°C. This temperature was evidenced by a bright blue flame.

Table V—Hardness of Polymethyl Alpha-Chloroacrylate (PMCA)

Hardness test	PMCA			Plexiglas II		
	No. of specimens	Average value	Range of values	No. of specimens	Average value	Range of values
Rockwell indentation						
M scale	36	M115	M98–M119	3	M98	M91–M106
E scale	36	E85	E77–E87		Not applicable	
Barcol hardness[a]						
Maximum	18	62.6	60–65	10	49.6	49–51
After 5 sec.	18	58.2	56–59	10	41.1	40–42
Tukon hardness[b]	18	34.6	31.7–38.2	6	19.5	18.3–20.7

[a] Manufacturer's instruction booklet; similar to ASTM Test Method D 676-49T for Shore Durometer Tests of Rubber Hardness. [b] "A Sensitive Pyramidal-Diamond Tool for Indentation Measurements," by F. Knoop, C. G. Peters, and W. B. Emerson, NBS J. Research *23*, 39 (July 1939); Research Paper RP1220.

Linear Thermal Expansion

The linear thermal expansion was measured according to Method 2031 of Federal Specification L-P-406a. The thermal expansion tests were made from −40°C. to +40°C. with the extension read for every 2°C. of temperature rise. A plot of expansion versus temperature was made for each specimen to determine whether or not the expansion was a linear function with respect to temperature. It was found that for all specimens a slight change in slope occurred, generally in the range of 0° to 5°C. This may or may not be a transition point. Above and below this point the expansion curves were essentially straight lines.

The results are given in Table VII. The observed slope change or transition point (T_t) is given although it is felt that this is not an inherent property of the pure materials. The coefficients are given for above and below the transition temperature as taken from the plotted data. The average is derived arithmetically using the dial readings at −30°C. and +30°C.

To determine whether these observed transition points could be detected by other methods, several specimens were tested on a photoelectric interferometer. The thermal expansion curve as obtained by this method does not show a definite point where the slope of the curve undergoes an abrupt change. The plot, however, is a smooth curve with an increasing coefficient of thermal expansion with increasing temperature. The values for the coefficient of thermal expansion obtained in this test are given in Table VII. The Brit-

Table VI—Thermal Properties of Polymethyl Alpha-Chloroacrylate (PMCA)

Property	PMCA			Plexiglas II		
	No. of specimens	Average value	Range of values	No. of specimens	Average value	Range of values
Heat distortion temperature, °C.	12	132.2	130.0–134.1	4	94.2	92.9 –95.0
Flammability						
0.25 -in.-thick sheet, in./min.	6	Self-extinguishing		6	1.34	1.30– 1.37
0.125-in.-thick sheet, in./min.	6	Self-extinguishing		6	1.42	1.37– 1.45
Ignition characteristics[a]						
Flash temperature, °C.	1	232		1	282 300[b]	
Self-ignition glow temp., °C.	1	412		1	——	
Self-ignition flame temp., °C.	1	452		1	—— 449 462[b]	

[a] "A Method and Apparatus for Determining the Ignition Characteristics of Plastics," by N. P. Setchkin, NBS J. Research *43*, 591 (Dec. 1949); Research Paper RP2052. [b] Data from tests reported in NBS Research Paper RP2052.

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Table VII—Linear Thermal Expansion of Polymethyl Alpha-Chloroacrylate (PMCA)[a]

Material	Test method	No. of specimens	Apparent transition temperature, T_t	Average coefficient of linear thermal expansion: Above T_t	Below T_t	−30° C. to +30° C.	Std. dev.[b]
			°C.	10^{-5} in./in./°C.	10^{-5} in./in./°C.	10^{-5} in./in./°C.	10^{-5} in./in./°C.
PMCA	Quartz tube	7	5	5.80	4.86	5.22	0.06
	Interferometer	2	—	—	—	5.29	—[c]
Plexiglas II	Quartz tube	4	7	7.11	6.06	6.37	0.08
	Interferometer	1	—	—	—	6.63	—

[a] Conditioned at 23° C. and 50% relative humidity. [b] Applies to values of coefficient, −30° C. to +30° C. [c] Both specimens gave the same value.

Table VIII—Optical Properties of Polymethyl Alpha-Chloroacrylate (PMCA)

Property	PMCA: No. of specimens	PMCA: Average value	PMCA: Range of values	Plexiglas II: No. of specimens	Plexiglas II: Average value	Plexiglas II: Range of values
Index of refraction, n_D^{30}	18	1.5177	1.5168–1.5193	3	1.4911	1.4905–1.4920
Light transmission,[a] %	21	92.0	90.7–92.7	4	92.4	92.2–92.5
Haze,[a] %	21	2.0	0.5–3.1	4	0.7	0.5–0.9
Crazing under stress						
Acetone	5		No effect	3		Slight crazing
Carbon tetrachloride	5		No effect	3		No effect
Methanol	5		No effect	3		No effect

[a] Determined with a Hunter integrating sphere hazemeter.

ish PMCA is reported[2] to have a coefficient of linear thermal expansion of 0.00005 to 0.00007 per °C.

Index of Refraction

The index of refraction was determined in accordance with Method 3011 of Federal Specification L-P-406a. Alpha-bromonaphthalene was used as the contact liquid for both materials. The results are given in Table VIII. No difference was noted between the ⅛-in. and ¼-in.-thick sheets of PMCA. The British PMCA

Table IX—Permanence Properties of Polymethyl Alpha-Chloroacrylate (PMCA)

Property	PMCA: No. of specimens	PMCA: Average value	PMCA: Range of values	Plexiglas II: No. of specimens	Plexiglas II: Average value	Plexiglas II: Range of values
Accelerated service, 1 cycle						
Weight change, %	6	0.21	0.20– 0.22	2	0.28	0.28– 0.29
Length change, %	6	0.06	0.03– 0.07	2	0.07	—0.07
Thickness change, %	6	0.13	0.0 – 0.78	2	0.0	—0.0—
Accelerated weathering						
0 hours						
Light transmission, %	18	92.2[b]	91.6 –92.7	3	92.5	92.4 –92.5
Haze, %	18	2.0	0.5 – 3.1	3	0.8	0.6 – 1.0
120 hours						
Light transmission, %	18	87.8[c]	84.5 –89.3	3	92.1	92.1 –92.2
Haze, %	18	2.0	0.7 – 3.2	3	0.8	0.5 – 1.1
240 hours						
Light transmission, %	18	86.1[d]	82.9 –88.2	3	92.0	92.0 –92.1
Haze, %	18	2.2	0.9 – 3.4	3	1.2	0.8 – 1.8
Natural weathering[a]						
0 days						
Light transmission, %	6	92.0[e]	90.7 –92.7			
Haze, %	6	2.0	0.5 – 3.1			
61 days						
Light transmission, %	6	88.8[f]	87.4 –90.2			
Haze, %	6	2.1	0.8 – 3.3			
158 days						
Light transmission, %	6	87.3[g]	85.3 –89.2			
Haze, %	6	2.4	1.1 – 3.6			

[a] Outdoors, 45° facing south, Apr. 26, 1951-Oct. 1, 1951. [b] Colorless, transparent. [c] Weak yellow, transparent. [d] Clear yellow, transparent, no crazing. [e] Colorless, transparent. [f] Weak yellow, transparent. [g] Yellowish gray to greenish yellow, transparent, no crazing.

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Table X—Resistance to Chemicals[a] of Polymethyl Alpha-Chloroacrylate (PMCA)

Chemical	Change for PMCA in			Change for Plexiglas II in		
	Weight	Length	Thickness	Weight	Length	Thickness
	%	%	%	%	%	%
Sulfuric acid, 30%	+0.24	+0.04	−0.55	+0.32	+0.04	+0.27
Sulfuric acid, 3%	+0.35	+0.02	−0.29	+0.57	+0.12	+0.28
Sodium hydroxide, 10%	+0.29	+0.01	−0.51	+0.46	+0.08	+0.28
Sodium hydroxide, 1%	+0.34	+0.02	0.0	+0.58	+0.12	0.0
Ethyl alcohol, 95%	+0.01	−0.02	−0.03	+2.58	+0.03	+3.42
Ethyl alcohol, 50%	+0.27	+0.02	−0.24	+0.64	+0.04	0.0
Acetone	+0.15	+0.02	−0.25	Dissolved completely		
Ethyl acetate, c.p.	−0.07	−0.02	−0.29	Dissolved completely		
Ethylene dichloride	−9.32	−0.21	−5.03	Dissolved completely		
Carbon tetrachloride, c.p.	+0.04	−0.01	−0.78	+0.10	0.0	+0.27
Toluene	+0.05	+0.04	−0.25	−17.18[b]	−4.06[b]	−5.00[b]
Heptane, b.p. 90–100°C.	+0.05	0.0	−0.29	+0.11	−0.01	0.0
Sodium chloride, 10%	+0.30	+0.15	−0.26	+0.49	+0.04	+0.28
Distilled water	+0.34	+0.09	+0.27	+0.59	+0.08	0.0

[a] Immersion for 7 days at 23° C. [b] Partially dissolved.

is reported[2] to have an index of refraction of 1.52.

Light Transmission and Haze

The values in Table VIII are the averages of the initial readings in the tests for abrasion resistance and accelerated weathering. With but few exceptions the values of light transmission for sheet D were highest with sheet F being next and E the lowest. The same relation was true for haze with D, F, and E in the order of increasing haze.

Crazing Resistance under Stress

The crazing resistance was determined in accordance with Method 3053 of Federal Specification L-P-406a. The reagents used to test for crazing were acetone, carbon tetrachloride, and methanol. The test results are given in Table VIII.

Specific Gravity

The specific gravity was determined by Method 5011 of Federal Specification L-P-406a. This method measures the specific gravity of the test specimen by its loss of weight when weighed in water after being weighed in air. The results expressed as the density of the material at 23°C. relative to the density of distilled water at 23°C. are as follows:

	Average	Range
PMCA	1.47	1.47–1.48
Plexiglas II	1.18	1.18–1.19

British PMCA is reported[2] to have a specific gravity of 1.49.

Accelerated Service

The accelerated service test was made in accordance with Method 6011 of Federal Specification L-P-406a using test procedure V. One cycle of this test consists of the following series of exposures:

1) 24 hr. at 80°C. over a saturated aqueous solution of sodium chloride, which gives 70 to 75% relative humidity
2) 24 hr. at −40°C.
3) 24 hr. at 80°C. in a circulating-air oven
4) 24 hr. at −40°C.

The results are given in Table IX. The result for the thickness change in PMCA is entirely due to one specimen of the six showing a change of 0.001 in.; all the other specimens had no measurable thickness change. There was no difference in the results among the various PMCA sheets.

Accelerated Weathering

The accelerated weathering test was made in accordance with Method 6021, Federal Specification L-P-406a. The S-1 sunlamp bulbs used were burned for at least 50 hr. before start of the tests and less than 400 hr. at the end of the tests. The results are given in Table IX. All 18 PMCA specimens turned a definite yellow color while the Plexiglas II specimens were apparently unaffected. The PMCA was still very transparent and showed no other visible effects. The different sheets gave different results; however, within each sheet the results were very uniform. Sheet D gave consistently higher light transmission and lower haze readings than the other two sheets. No difference in the amount of yellowing of the different sheets was noticeable.

Natural Weathering

Six specimens of PMCA were exposed to outdoor weathering conditions at Washington, D. C. The specimens were first exposed on April 26, 1951, and measurements were made at approximately 80-day intervals. The results are given in Table IX. Sheets D, F, and E were in that order progressively lower in light transmission and greater in haze and discoloration. No weathering test was made on the Plexiglas II, as such a short period of 160 days has no effect on the material.

Chemical Resistance

Chemical resistance was determined in accordance with Method 7011 of Federal Specification L-P-406a. Results are given in Table X.

The PMCA was affected by only two of the chemicals used. Ethylene dichloride was the only one to cause an appreciable weight change. Each of the three specimens tested in ethylene dichloride showed pit markings. The surface on one specimen was completely covered by these markings and had the appearance of frosted glass. On all the specimens the markings were only on the surface and did not go into the material internally.

The other chemical that affected

(Continued on p. 188)

Table XI—Water Absorption of Polymethyl Alpha-Chloroacrylate (PMCA)

Property	PMCA			Plexiglas II		
	No. of specimens	Average value	Range of values	No. of specimens	Average value	Range of values
Water absorption						
Weight change, %	9	0.17	0.16–0.18	3	0.43	0.42–0.44
Length change, %	9	0.01	0.00–0.07	3	0.06	0.03–0.07
Thickness change, %	9	0.17	0.00–0.79	3	0.00	—0.0—

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Furfural as a Resin Former

by EDWARD A. REINECK†

BY far the largest quantity of furfural used in resin manufacture is consumed by the phenolic resin industry. There are lesser quantities of furfural which are used in specialty resins such as acid-catalyzed furfural, furfural-ketones, and furfural-aniline.

The term phenolics includes plastics and resinous products made by the reaction of aldehydes with aromatic chemicals such as phenol, cresol, xylenol, and resorcinol. Resins made with cashew nut shell oil and aldehydes may also be included since the aldehyde reactive parts of the oil (cardinol and cardol) are phenolic bodies.

The first commercial production of furfural-phenol resins is credited to Durite Plastics, Inc. For years the basic patents were held by this concern in whose laboratories uses for furfural-phenolics were developed by E. E. Novotny and his associates. The molding compounds produced by Durite over a period of years have a flat viscosity curve at temperatures just above the fusion point and a very steep viscosity curve at higher temperatures. To put it another way, the compounds exhibited long flow at the lower molding temperatures, but converted rapidly to infusibility at higher than standard molding temperatures (350-400° F.).

Consumers of phenolic resins today evaluate resins and compounds on the basis of properties, and associate these with a phenolic trade name and code number rather than with the particular aldehydes and phenol bodies used to achieve these properties. In the final analysis, properties are the most important considerations for the job at hand. With the above premise, it is less useful from a commercial standpoint to discuss the properties of furfural-phenolics, but it is interesting and appropriate to talk about the properties which furfural contributes as an aldehyde in phenolic resin production.

† Assistant Sales Manager, Chemicals Dept., The Quaker Oats Co.

Formaldehyde is the aldehyde used in greatest quantity by the phenolic resin industry; furfural is the most prominent of the aldehydes used for modifying purposes. Furfural as currently used by phenolic resin manufacturers contributes special and useful flow properties to the phenolic resins of commerce. It is primarily used in reaction with synthetic phenol to prepare lump resins which in turn are ground and blended with fast-curing formaldehyde-phenol powdered resins in suitable ratios. Another obvious and practiced method is to react mixtures of furfural and formaldehyde with phenol in the reaction kettle itself. In either case the blends thus produced are either compounded with fillers in the case of molding powders, or become phenolic resins of commerce as binders for resinoid abrasive wheels, brake linings, adhesives, laminating varnishes, and the like.

In many uses of thermosetting phenolic resins the ratio of the rate of flow under the application of heat, or heat and pressure, to the time of cure is the governing factor in the usefulness of a resin. This relation of the physical property of flow to the time required to convert the product to the infusible stage is recognized as being especially important in molding applications. The optimum balance of flow and rate of cure results in fast cure with the maximum in strength and appearance.

In general and assuming the use of synthetic phenol as the phenol body, the lower the molecular weight of the aldehyde the shorter the flow period, due to increased cross-linking rate. In the case of formaldehyde (molecular weight of 30) the flow interval is very short, i.e., gelation is reached rapidly and complete cure follows almost immediately. In many phenolic resin uses this is desirable, but for an important number of uses the flow interval of formaldehyde reaction products is too short. In the case of furfural (molecular weight of 96) the flow interval is long due to a slow rate of reaction. Hence the phenolic resin industry employs combinations of furfural and formaldehyde in numerous instances. A complete spectrum of flow-cure properties are achieved by utilizing the reaction rates of the two aldehydes. The terms "furfural-phenol" or "formaldehyde-phenol" are therefore becoming less useful in being able to accurately describe the contents of most commercial phenolic resins.

Furfural as supplied commercially is essentially anhydrous and therefore offers an advantage in shipment

Table I—Raw Material Costs of Phenolic Resins[a]

Resin System	Yield of resin	Cost of furfural-phenol resin with furfural at: 11¢ per lb.	13¢ per lb.	Cost of formaldehyde-phenol resin with formalin at: 3¢ per lb.	5¢ per lb.
	lb.	¢/lb.	¢/lb.	¢/lb.	¢/lb.
Furfural 87 lb. and phenol 100 lb.	171	16.1	17.2		
Formalin[b] 73 lb. and phenol 100 lb.	111			18.2	19.5

[a] Assuming phenol cost of 18¢ per lb.
[b] As 37% aqueous solution of formaldehyde

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and storage as well as in the manufacturing operation. Kettle capacity is enhanced since there is no water of solution to be removed during the reaction period as is the case with formalin.

The high molecular weight of furfural as compared with formaldehyde is attractive. Assuming a mole ratio of aldehyde to phenol of 0.85 to 1.0 and theoretical yield in each reaction, 100 lb. of phenol when reacted with formaldehyde will produce about 111 lb. of resin, whereas the same amount of phenol in reaction with furfural produces 171 lb. of resin. This characteristic also reflects favorably for furfural in cost considerations; note in Table I that the raw material cost of a furfural-phenol resin is appreciably lower than that of a formaldehyde-phenol resin.

A cost calculation of this type, even though it is based on approximate 1951 delivered prices of the chemicals involved, does not tell the whole story. It is the combination of cost and desired properties that determines which aldehyde or ratio of the two aldehydes or which phenol bodies are used in producing phenolic resins. The cost advantage of furfural is a powerful incentive to stimulate the development of new phenolics. There is evidence that such resins are fairly well along on the road to becoming commercial realities.

Uses of Furfural Resins

The single largest application of furfural in the phenolic resin industry is in the production of molding compounds. Five years ago the present giant sized phenolic moldings were unheard of. Since that time phenolic molding powder manufacturers pioneered the development of long-flow compounds, and in cooperation with press builders and molders made possible the deep-draw molding of a large TV console cabinet and other large and complex moldings. Recently further perfected compounds permit production of two console cabinets in a single press, closing with the ease and precision long common in the molding of small parts. Furfural played an important role as a raw material in designing phenolic resin blends which helped to make possible the first large moldings. Its value as an economical means to lengthen the flow of fast curing phenolics is now well recognized by the phenolic industry; 20 to 25% of the total phenolic molding powder produced in 1950 contained furfural-phenol resin as a modifier. This attests not only to the successful use of furfural as a means of designing deep-draw compounds, but also points to the prominence in the present market of fast-curing phenolic compounds with long-flow properties. In 1952 furfural is expected to increase its position so that 30 to 35% of the total phenolic molding powder production will be thus modified.

While most of the furfural market is based on its use as a modifier, substantial applications also exist in the phenolic resin industry in which furfural is not a modifying aldehyde but rather the primary aldehyde which contributes the desired properties to the phenolic resin. With respect to molding powders, appreciable amounts of such compositions are manufactured from 100% furfural-phenolics as the primary resin base. As far as we have been able to ascertain, these unblended compounds are used for molding thick castings and parts having heavy sections. It is admitted that there is some sacrifice in the curing speed of such compounds at normal curing temperatures, but the slower cure allows better heat penetration and results in less case hardening from a rapidly cured surface.

The 100% furfural-phenolic resins are outstanding for use with high mineral filler compounds. This characteristic is also shared by phenolic blends containing appreciable amounts of furfural-phenol resins. Such compositions have little or no tendency to stick in the mold during the curing cycle. One user explains this by saying that furfural phenolics do not seem to "dry out" on the molded surface, but instead leave a resin film on the mineral filler which permits better release from the mold. This can probably be explained on the basis of better wetting and penetration by the resin of the mineral fillers.

Another such application is in the manufacture of asphaltic storage battery cases (U.S.P. 2,501,995). Most of the automotive storage battery cases manufactured in recent years have been made from an asphaltic composition containing asphalt, a small amount of synthetic resin, mineral filler, and an organic fiber. The majority of these cases contain a fluid furfural-phenol reaction product as the synthetic resin. The purpose of the phenolic resin additive is to render the molded composition resistant to attack by the battery acid (sulfuric acid of 1.3 specific gravity). Specifically, the resin inhibits the penetration of battery acid into the wall of the battery case by the formation of a barrier when battery acid contacts the composition. The processing conditions of battery case manufacture call for a fluid resin which is compatible with asphalt, does not polymerize at a maximum processing and molding temperature of 300° F., and does polymerize promptly at essentially room temperature when battery acid is introduced into the case during assembly. A furfural-phenol resin meets these requirements adequately.

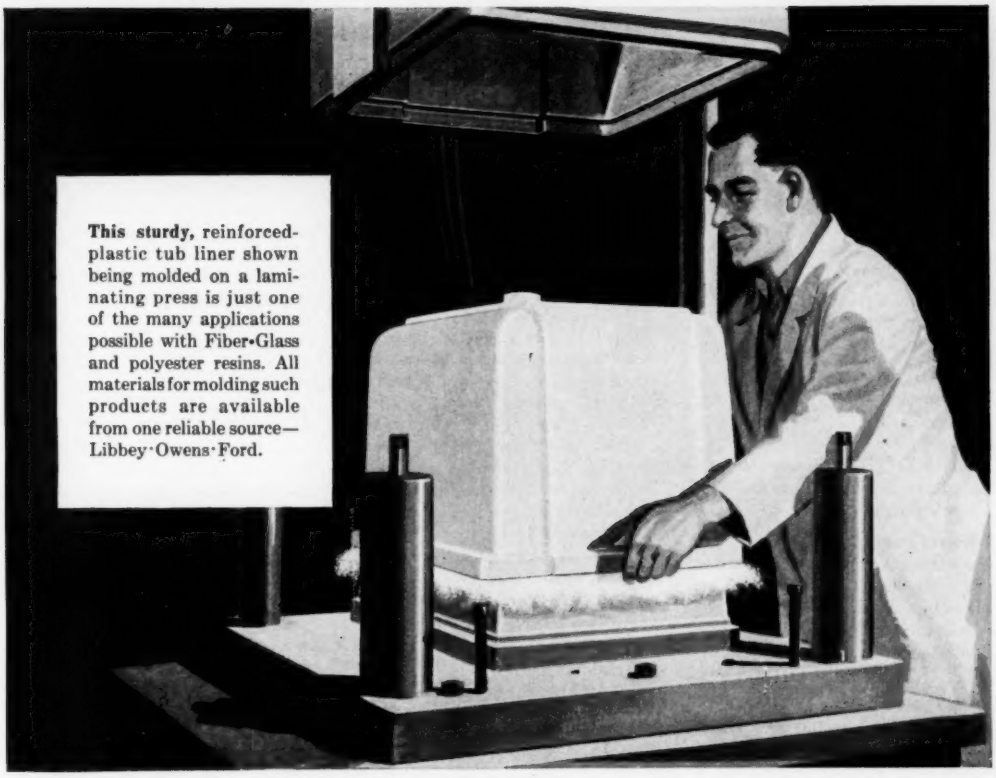
Furfural plays an important role in production of a phenol-base laminating varnish.[1] The use of furfural with lesser amounts of formaldehyde in combination with phenol results in a varnish with equivalent electrical and better mechanical qualities than are usually obtained with a cresol-base varnish. This phenol-base varnish is dark brown in color instead of the usual yellow of the formaldehyde-cresol varnishes, and is not modified with inert materials as has so often been attempted in producing a good electrical varnish with phenol.

Cashew nut shell oil in reaction with furfural produces dark liquid resins, fusible solids, or infusible solids with properties not obtainable with other aldehydes or phenol bodies. In general, the resins have unusual evenness of frictional characteristics over wide ranges of temperature; hence they find application as binders or constituents of friction elements primarily to be used for automotive brakes and automotive clutches.

Phenolic bagasse molding compounds as well as bonding resins are available[2] which cure rapidly at relatively low temperatures and pressures. Dark thermoplastic resins of this type find use as binders for phonograph records and plasticizers for shellac and vinyl compounds.

[1] Plyophen #5040, Reichhold Chemicals Inc.
[2] Valite Corp.

(*Continued on p. 195*)



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Materials

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INVESTIGATIONS OF PHENOLIC RESINS FOR MAKING IMPROVED WOOD. I. PREPARATION AND EXAMINATION OF THE RESINS. L. K. Dalton, J. S. Fitzgerald, and H. H. Hatt. Australian J. Applied Sci. 2, No. 2, 288-305 (1951). Published information concerning the composition of phenol-formaldehyde resin solutions used for the preparation of improved wood is briefly reviewed. Details are given for the production of resol solutions by batch and continuous processes. The resol solutions used for the production of improved wood are all in the early stages of condensation. Granger's method therefore provides a suitable way of differentiating between them by fractionation into free-phenol, water-soluble, and water-insoluble resins, although the method is not sufficiently rapid for laboratory control. The course of the reaction between phenol and formaldehyde may be followed to some extent using this method, and differences between sodium hydroxide and ammonia as catalysts demonstrated. With ammonia, a water-insoluble fraction forms immediately, but with sodium hydroxide only water-soluble entities form for a considerable period. The analytical method may also be used to show the relationship between condensation during aging, which is independent of resin dilution and sodium hydroxide concentration, and the homogeneous life of the resol solution, which is dependent on both.

RELATION OF COMPOSITION OF POLYVINYL ACETATES TO THEIR PHYSICAL PROPERTIES. I. ACETALS OF SATURATED ALIPHATIC ALDEHYDES. A. F. Fitzhigh and R. N. Crozier. J. Polymer Sci. *8*, 225-41 (Feb. 1952). Polyvinyl alcohol was condensed with straight and branched chain aldehydes ($C_nH_{2n}O$, n = 2 to 8) to varying degrees of completion. Measurements on resins and plasticized compositions included apparent modulus of elasticity at various temperatures, brittle temperature, tensile strength and elongation, and solubility. From these measurements it is concluded that 1) Increasing degree of acetalization results in lowered transition temperature, lower stiffness at transition, narrower transition range, higher brittle temperature, decreased tensile strength, and shift in solubility toward solvents of lower dielectric constant; 2) Acetals of higher normal aldehydes have lower transition and brittle temperatures, lower tensile strength, and more limited solubility; 3) Branched chain aldehydes have higher transition and brittle temperatures than their normal isomers.

CATALYTIC CONVERSION OF A DIENE INTO DEEPLY COLORED POLYMERS. B. Eisler, S. D. Farnsworth, E. Kendrick, R. Schnurmann, and A. Wassermann. J. Polymer Sci. *8*, 157-61 (Feb. 1952). Cyclopentadiene can be catalytically converted into a deep red polycyclopentadiene-trichloroacetic acid adduct (I). Oxidation and hydrogenation experiments show that each repeating unit of (I) contains one double bond. Other observations, including spectroscopic and electrochemical measurements, indicate that these double bonds are conjugated, and that this polymerization involves the migration of hydrogen atoms. The kinetics of the formation of (I) are investigated and some results of these measurements, together with those pertaining to the alkaline hydrolysis of (I), make it probable that the initiation step is an acid-catalyzed esterification of the diene and that the final polymer is an ester. Colloid chemical properties of (I) are described.

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LIGNIN-REINFORCED NITRILE, NEOPRENE, AND NATURAL RUBBERS. J. J. Keilen, W. K. Dougherty, and W. R. Cook. Ind. Eng. Chem. *44*, 163-7 (Jan. 1952). The combination of properties obtainable with lignin when coprecipitated with natural, nitrile, or neoprene rubbers, as well as with GR-S, is novel. In addition to tensile strengths, which are at least of the same order as, and in certain cases superior to, those obtained with the carbon blacks, good abrasion resistance and tear resistance result. In GR-S, nitrile, and

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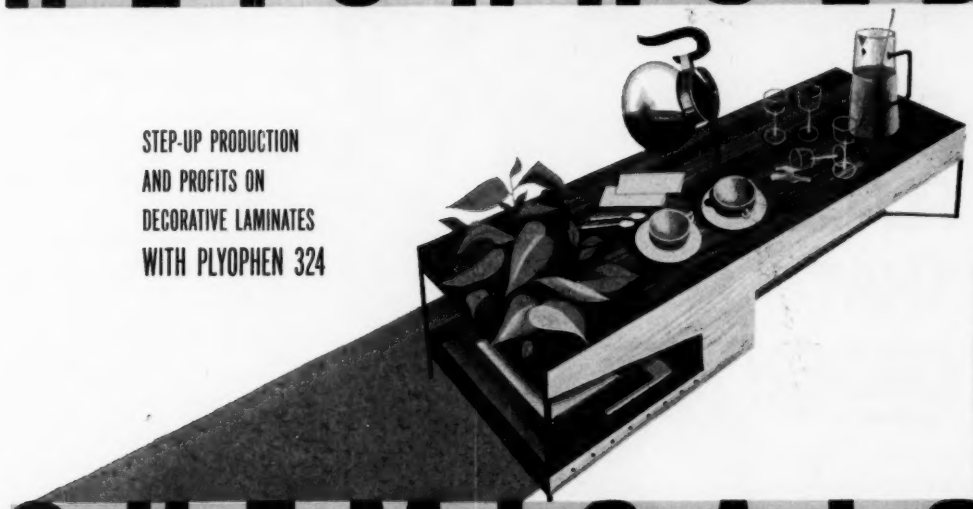

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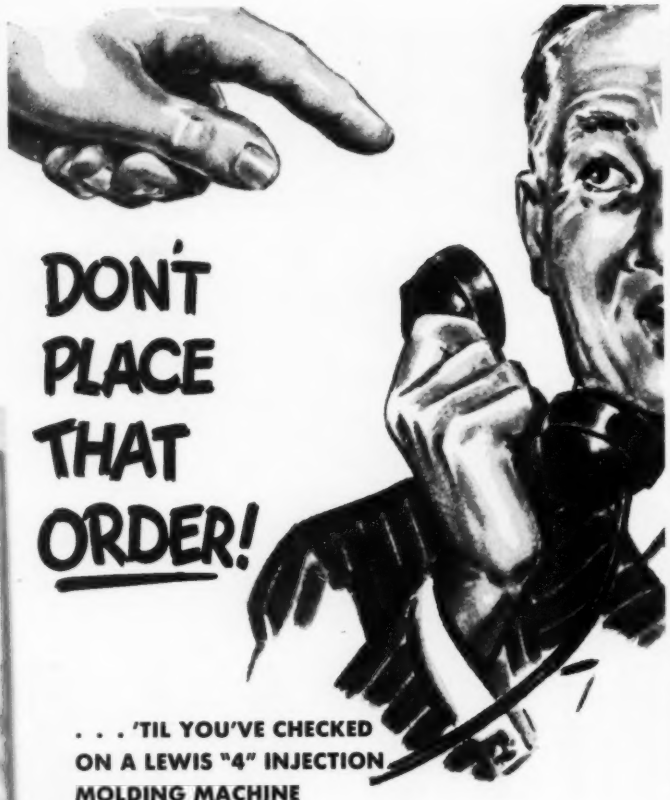

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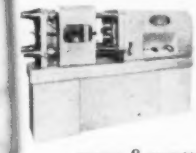

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Molding and Fabricating

EXTRUSION OF VINYL FILM. A. M. Stover. SPE J. *8*, 13-14, 24 (Feb. 1952). A new technique for the production of vinyl plastic film by a blow molding procedure is described. The physical properties of the films are fully as good as those made by other methods with the advantage that the production of the films by blow molding is more economical.

USE OF AIR-GAP INSULATION IN PLASTIC MOLDS. W. Kosobud. SPE J. *8*, 11-12 (Jan. 1952). The use of air-gap insulation in the design of plastic molds to control the temperature is described.

A PROPOSAL FOR ESTABLISHING CERTIFIED INJECTION MOLDING MACHINE SPECIFICATIONS. D. J. Sloane. SPE J. *8*, 7-9, 10 (Jan. 1952). A proposal is made for standardizing the methods or procedures for rating the performance of injection molding machines.

Applications

SEMI-RIGID VACUUM PACK. Modern Packaging *25*, 106-7 (Feb. 1952). Meats are packaged in vacuum containers made of saran plastic film and a metal base.

PRINTED CIRCUIT TECHNIQUES: AN ADHESIVE TAPE-RESISTOR SYSTEM. B. L. Davis. National Bureau Standards Circular 530, 83 pp. (Feb. 29, 1952). A carbon-resin film-type resistor in tape form which is self-adhesive and suitable for use in printed circuitry has been developed. The range covered is 10 ohms to 10 megohms. The use of asbestos paper tape and silicone resin binder results in a resistor capable of operation up to 200° C. The size

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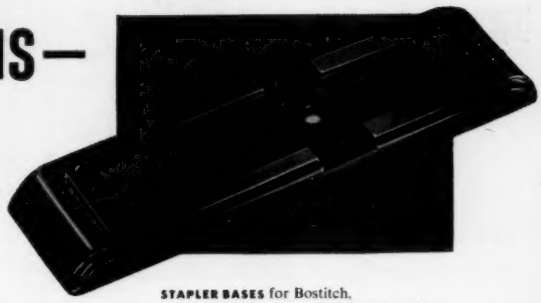

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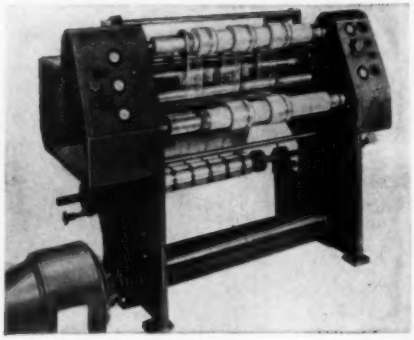

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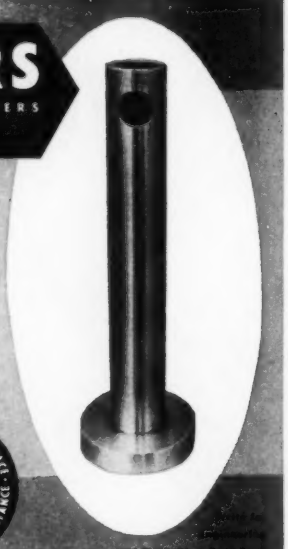

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of the resistor is fixed, 0.130 by 0.300 inch. Resistance values are varied by changing the resin-to-carbon ratio and by changing carbons. The curing temperature is high, 300° C. for several hours. Consequently the tape is applicable at present only to glass or ceramic-base materials. Satisfactory operation is considered to be less than ±6% change during 500 hr. under ¼-watt load at the stated ambient temperatures. Other electrical characteristics are similar to those of commercial carbon-resin film-type resistors.

PLANTS OF PLASTIC. Chem. Week *69*, 37-8, 40, 42 (Nov. 17, 1951). Recent developments in applications of polyvinyl chloride and saran are described. Polyvinyl chloride is imported from England and France as well as being made here. One of the largest potential uses considered is pipe, fittings, ducts, tanks, and the like where resistance to water and chemicals is required.

P.V.C. CINEMA SCREENS. Brit. Plastics *25*, 38-9 (Feb. 1952). Projection screens are made of nonrigid polyvinyl chloride sheeting. The advantages and construction are described.

NYLON PARTS FOR BALL BEARINGS. R. W. Recknagel. Product Eng. *23*, 119-23 (Feb. 1952). The results of tests made to evaluate nylon races and seals for ball bearings and to compare them with similar rubber and steel parts are described. The results are favorable to the use of nylon in such applications.

Properties

HEAT DISTORTION OF POLYSTYRENE. K. J. Cleereman, H. J. Karam, and J. L. Williams. ASTM Bulletin No. 180, 37-44 (Feb. 1952). Annealing of polystyrene results in raising the measured heat distortion temperature. This temperature is a function of annealing time and temperature. This is true for all three types of polystyrene investigated. For all types of polystyrene considered, a maximum heat distortion temperature is obtained. This value is a reliable index for control purposes, since it is independent of molding conditions, aging conditions, and annealing techniques. From a practical viewpoint, this maximum value represents the uppermost temperature at which fabricated articles made

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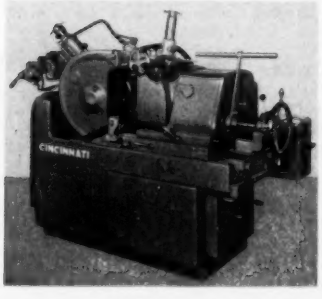

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from the given plastic may be considered for use. Some physical properties such as resistance to crazing improve upon annealing. However, tensile strength, elongation, and impact strength show little change.

FATIGUE TESTS UNDER AXIAL LOADS OF ALUMINUM JOINTS BONDED WITH A RESINOUS ADHESIVE. W. N. Findley, B. A. Century, and C. P. Hendrickson. ASTM Bulletin No. 179, 67-71 (Jan. 1952). Results of fatigue tests of aluminum alloy joints bonded with a resinous adhesive are presented. Single-lap, double-lap, and butt joints were tested in an axial-load fatigue machine. The methods of testing, the merits of the three procedures employed, and the test results obtained are discussed. The fatigue strength at 10^7 cycles of butt joints of a Cycleweld adhesive was found to be about three times the fatigue strength of double-lap specimens (1640 p.s.i. normal stress and 520 p.s.i. shearing stress, respectively) under axial loading with a mean stress of zero. The fatigue strength of single-lap joints of the adhesive were found to be about 23% greater than the double-lap specimens for the same loading conditions. The following suggestions are advanced to explain the differences: 1) They may be caused in part by differences in the state of combined stress existing in the three types of specimens; 2) A butt-joint specimen can be made to yield data on the strength of the adhesive under the action of a single principal stress (simple tension or compression) only by special procedures or special selection of the material of the adherent; 3) The stress in the adhesive is more closely approximated by elementary formula in specimens of the double-lap type than in single-lap or butt-joined specimens.

A METHOD FOR DETERMINING THE PROPAGATION CONSTANTS OF PLASTICS AT ULTRASONIC FREQUENCIES. H. J. McSkimin. J. Acoustical Soc. America 23, 429-434 (July 1951). A pulse technique particularly suited to dissipative materials is described for measuring attenuation and phase shift constants of plastics, using either transverse or longitudinal waves in the frequency range of 5-50 mc. A thin wafer of the material under test is placed between two identical fused silica buffers; and waves generated by quartz crystals at the ends of the assembly are transmitted simultaneously through the specimen in both directions. Comparison of transmitted and reflected components by means of a special balancing circuit provides data from which the complex propagation constant can be calculated, and hence dynamic rigidities and viscosities. Illustrative data for polyethylene and nylon are given in this article.

Testing

EVALUATION OF WAXED-PAPER SEALS. J. W. Padgett, E. A. Yermakoff, and S. T. Van Esselstyn. Modern Packaging 25, 121-9 (Feb. 1952). A method for determining the sealing strength of waxed papers was developed which gives adequate reproducibility and fair correlation with commercial practice. Precision probably could be improved further, but it is doubtful whether it is required for most sealing-strength determinations. Provided the weighing system is of the proper sensitivity, satisfactory reproducibility is obtained if the angle and rate of peel,

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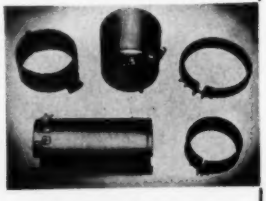

For extra high loading the mica insulation is replaced by refractory material firmly embedding the element.

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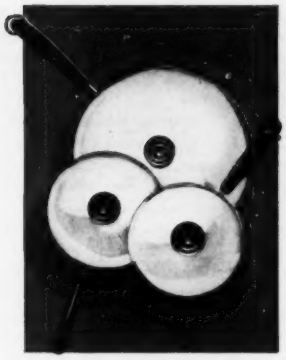

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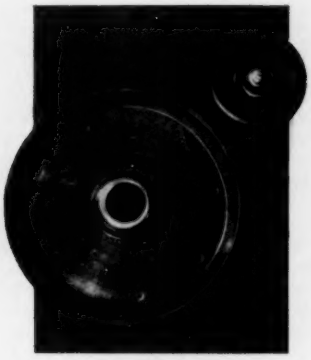
Molded by Shaw Insulator Co., Irvington, N. J., for Baker Brush Co., New York, New York.



Electrical resistivity of these textile pulleys prevents build-up of high static charges as fibers pass over them. Made of **BAKELITE Medium-Impact Resistant Phenolic BM-14111,** they're light in weight, strong, smooth, and wear-resistant.

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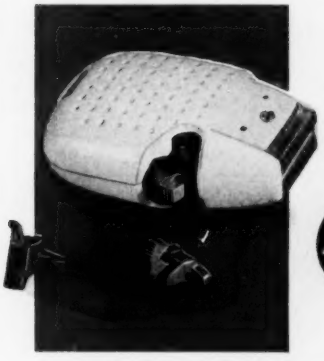
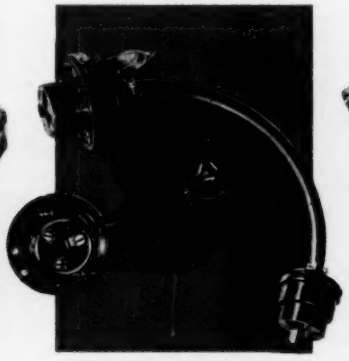


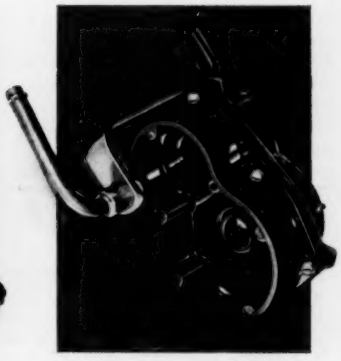
Complex shape, close tolerances, good color, and durability characterize starter buttons for Schick "20" electric shavers. Made of Tan **BAKELITE General-Purpose Phenolic BM-17020,** they have excellent insulating properties and are rapidly mass produced by transfer molding.

Molded by Shaw Insulator Co., Irvington, New Jersey.



This heavy-duty three-terminal electrical connector for trailer coaches has plug and receptacle of Black BAKELITE Improved-Impact Phenolic BM-6260. They stand up under a 30 amp., 110 volt current, are resistant to mechanical shock and to moisture.

Molded for Theodore Bargman, Detroit, Mich., by Molded Products Company, Detroit, Mich.



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Molded by Plastic Research Products, Urbana, Ohio.

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paper quality, atmospheric aging and testing conditions, and variables affecting the method of sample preparation are controlled within prescribed limits. It is shown that the method is suitable both for quality control and for the developing of waxed papers which have improved sealing qualities.

AN ELECTRICAL EXTENSOMETER FOR DETERMINING ELONGATION OF ELASTOMERS. C. H. Klute, C. J. Penther, and L. B. McKee. ASTM Bulletin No. 180, 44-49 (Feb. 1952). The extensometer is so designed that the specimen contributes only a negligible amount of energy to the sensitive elements of the instrument. This energy serves only to energize shaded pole motors through thyratron circuits and the motors so energized then contribute the power to operate the extensometer. The extensometer comprises two light dural carts which move along a track parallel to the direction of stretching. A cable runs from each cart over pulleys to a remote drive motor. Sensitive elements, carried on each of the two carts, contact the specimen at points corresponding to the upper and lower bench mark position, respectively, and accomplish the motor control. The extensometer is easily attachable to the conventional rubber testers. It selects the initial 1-in. separation of reference points, follows the extension continuously, spark-indicates the loads at each 100% elongation, and indicates the elongation at break. It is adaptable to drawing load-elongation diagrams and to operation below and above normal temperatures. This apparatus allows the routine determination of tensile properties with an accuracy exceeding that of techniques generally employed today and simultaneously reduces the labor involved in the test. It is successful with materials ranging in stiffness from almost gummy to almost horny.

Chemistry

KINETICS OF ALKALINE-CATALYZED PHENOL-FORMALDEHYDE REACTION. AMMONIA; SODIUM HYDROXIDE. L. M. Debing, G. E. Murray, and R. J. Schatz. Ind. Eng. Chem. *44*, 354-9 (Jan. 1952). The study of the initial phase of the alkaline-catalyzed phenol-formaldehyde reaction was undertaken to obtain quantitative reaction rate data, using "commercial" concentrations of reactants, with the expectation that kinetic interpretations of these data would be forthcoming. The hexa-catalyzed phenol-formaldehyde reaction at various temperatures, mole ratios of phenol to formaldehyde, and hexa concentrations exhibit first-order behavior. Incubation periods are observed when low catalyst concentrations and temperatures are used. Under the conditions of investigation, the sodium hydroxide-catalyzed reaction is found to follow second-order rate behavior when the concentrations of active positions of phenol and formaldehyde are used instead of their molar concentrations and when the effect on the reaction rate of substitution in the phenolic nucleus is taken into consideration. Reaction rate constants and the activation energy, E, were calculated for both catalyst types. Tertiary amines, although derivatives of ammonia, exhibit rate behavior essentially identical to that of sodium hydroxide. An independent discovery of a previously reported phenomenon called cloud point is described.

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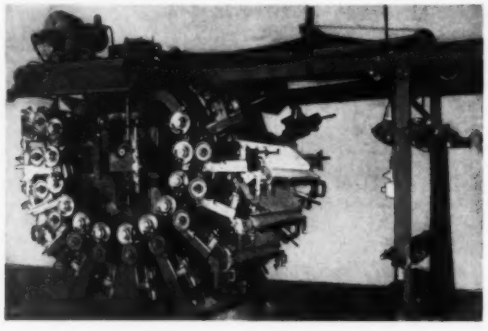

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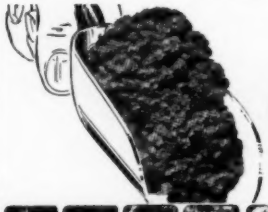

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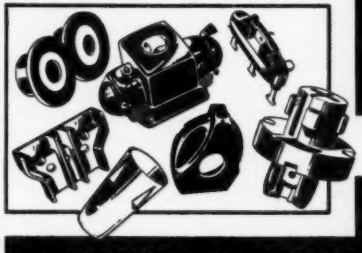

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BENZOIC ACID • CHLOROTOLUENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • CHLORINATED PARAFFIN • CHLORINE

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

ACRYLONITRILE COPOLYMERS. G. F. D'Alelio (to Koppers). U.S. 2,583,-325-6-7, Jan. 22. Copolymers of acrylonitrile with itaconic monoesters, conjugated dienes, or an ethylenic dicarboxylic acid monoester of a cyanoalcohol.

EXTRUSION. J. S. Eckert (to U.S. Stoneware). U.S. 2,583,330, Jan. 22. Method of giving an internal gloss to a tube of plastic material.

POLYMERS. J. M. Groppel and G. E. Rumscheidt (to Shell). U.S. 2,583,-370, Jan. 22. Stabilizing diolefin polymer-sulfur dioxide reaction products with a thiourea compound.

BOOKBINDING. G. B. Wiser (to Marador). U.S. 2,583,403, Jan. 22. Bookbinding including plastic plates and hinge members.

MOLDING APPARATUS. L. E. Palmer (to Union Insulating). U.S. 2,583,441, Jan. 22. Apparatus for molding plastic lamp receptacles.

COPOLYMERS. E. M. Evans and J. E. S. Whitney (to British Resin Products). U.S. 2,583,638, Jan. 29. A copolymer of a vinyl phenol with coumarone, indene, or the like.

POLYMERS. L. N. Whitehill and W. M. McLamore (to Shell). U.S. 2,583,980, Jan. 29. Polymers of unsaturated esters of hydrazodicarbonic acid.

CONTAINER. C. E. Slaughter (to Extruded Plastics). U.S. 2,584,095, Jan. 29. Tubular thermoplastic container.

CELLULOSE DERIVATIVES. G. C. Daul and J. D. Reid (to U.S.). U.S. 2,584,-114, Feb. 5. Treating carboxymethylated or phosphorylated cellulose fibers with urea or melamine-formaldehyde.

COPOLYMERS. W. E. Hanford (to Du Pont). U.S. 2,584,126, Feb. 5. Copolymers of dichlorodifluoroethylene with ethylene.

AMINOPLASTS. H. P. Wohnsiedler, E. L. Kropa, and W. M. Thomas (to American Cyanamid). U.S. 2,584,177, Feb. 5. Modified aminoplasts and post-formable laminates formed therefrom.

POLYSULFIDES. W. S. Foulks (to Thiokol). U.S. 2,584,264, Feb. 5. Curing coatings of polysulfide polymers containing zinc chromate by exposing to vapors of an amine.

COPOLYMERS. F. G. Pearson (to American Viscose). U.S. 2,584,284, Feb. 5. Copolymers of trifluorochloroethylene and styrene.

POLYMERIZATION. C. W. Theobald (to Du Pont). U.S. 2,584,306, Feb. 5. Polymerization of ethylenically unsaturated monomers by contacting with a diazosulfone.

COPOLYMERS. R. J. Agnew (to Texas Co.). U.S. 2,584,315, Feb. 5. Copolymerizates of the diallyl ester of 4-chloro-1,2,3,6-tetrahydrophthalic acid and an unsaturated polyester.

ORGANOSILANE RESINS. J. T. Goodwin, Jr. and M. J. Hunter (to Dow Corning). U.S. 2,584,340-1-2-3-4, Feb. 5. Reaction of organosilanes with glycerol esters of dicarboxylic acids in forming of thermosetting resins.

ORGANOSILANE RESINS. M. J. Hunter and L. A. Rauner (to Dow Corning). U.S. 2,584,351. Feb. 5. Condensates of an organosilane with a polyhydric alcohol and thereafter with a polycarboxylic acid.

HARMONICA. J. Gaukstern (to ChrisKaff). U.S. 2,584,572, Feb. 5. Plastic harmonica.

CONTAINER. C. A. Southwick, Jr. (to Shellmar). U.S. 2,584,633, Feb. 5. Polyethylene pouch with fused seams.

COATING. P. Arcidiacono (to Harvel Research). U.S. 2,584,657, Feb. 5. Coating of vinyl resin and trioxane.

IMPREGNANT. A. P. Dunlop and P. R. Stout (to Quaker Oats). U.S. 2,584,681, Feb. 5. Composition of ammonium thiocyanate, an aldehyde, and furfuryl alcohol.

GARMENT BAG. E. M. London (to A. L. Siegel). U.S. 2,584,722, Feb. 5. Mothproofing resistant plastic garment bag.

POLYMERIZATION. W. B. Reynolds, J. E. Wicklatz and T. J. Kennedy (to Phillips Petroleum). U.S. 2,584,773, Feb. 5. Emulsion polymerization of vinylidene compounds in the presence of hydroperoxides of alkyltetrahydronaphthalenes.

HOMOGENIZER. J. Bailey (to Plax). U.S. 2,584,827, Feb. 5. Crossover homogenizing apparatus for plastic molding.

RESINS. A. F. Bidaud and L. Ceyzeriat (to Societe Des Usines Chemiques Rhone-Poulenc). U.S. 2,584,-835, Feb. 5. Preparation of thermosetting alkylpolysiloxanes.

POLYVINYL ACETATE. K. Elias (to A. Dawant). U.S. 2,584,852, Feb. 5. Coating comprising polyvinyl acetate, rosin, and tetrachloronaphthalene.

SAFETY GLASS. R. A. Gaiser (to Libbey-Owens-Ford) U.S. 2,584,859, Feb. 5. Safety glass containing an electrically conducting element embedded in the plastic layer.

COPOLYMERS. W. E. Catlin (to Du Pont). U.S. 2,584,968, Feb. 12. Copolymers of methacrylanilide with higher alkyl acrylic esters.

POLYMERS. J. R. Roach and H. Wittcoff (to General Mills). U.S. 2,-585,035, Feb. 12. Polymers of unsaturated ethers of polyhydric alcohols.

RESINS. M. K. Smith (to Baker Castor Oil). U.S. 2,585,053, Feb. 12. Thermoset plastics formed by oxygenating esters of polyhydric alcohols.

MOLDING. C. C. Graveson. U.S. 2,-585,112, Feb. 12. Injection cylinder for molding machines.

RESINS. S. O. Greenlee (to Devoe and Raynolds). U.S. 2,585,115, Feb. 12. Amine-epoxide compositions.

POLYAMIDES. D. C. Pease and C. T. Handy (to Du Pont). U.S. 2,585,163, Feb. 12. Synthetic linear polyamides.

MODIFIED PHENOLIC RESIN. R. K. Walton (to Carbide and Carbon). U.S. 2,585,196, Feb. 12. Alkylene-

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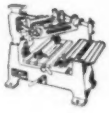

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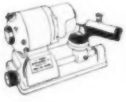

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polyamine modified phenol-formaldehyde resin.

WRINKLE COATING. R. K. Walton (to Carbide and Carbon). U.S. 2,585,197, Feb. 12. Heat-hardening alkylene polyamine modified phenolic wrinkle coating.

POLYAMIDE. F. K. Watson (to Du Pont). U.S. 2,585,199, Feb. 12. N-amino-alkylmorpholine viscosity stabilized polyamide.

MOLDING. R. O. Wondra (to Western Electric). U.S. 2,585,204, Feb. 12. Shut-off mechanism for an injection nozzle.

VINYL RESIN. P. F. Bruins and E. J. Kurtz (to National Southern Products). U.S. 2,585,222, Feb. 12. Vinyl resin plasticized, with a mixture of a monohydric alcohol ester of the maleic anhydride adduct of rosin acid and a monohydric alcohol ester of a fatty acid.

POLYMERS. H. J. Hagemeyer, Jr., and H. N. Wright, Jr. (to Eastman Kodak). U.S. 2,585,242, Feb. 12. Compositions comprising acrylonitrile polymers and acetylated hexahydro-S-triazines.

POLYESTERS. W. E. Elwell and D. C. McGowan (to California Research). U.S. 2,585,323, Feb. 12. Polymeric polyesters of pyromellitic acid and dihydric alcohols.

COPOLYMERS. R. R. Whetstone and T. W. Evans (to Shell Development). U.S. 2,585,359, Feb. 12. Diallylester copolymers and compositions of nitrocellulose therewith.

HYDROXYACETIC ACID. M. L. Beck (to Du Pont). U.S. 2,585,427, Feb. 12. Polymerizing hydroxyacetic acid in the presence of antimony trifluoride and triphenyl phosphite.

ACRYLONITRILE. C. D. Coxe (to Du Pont). U.S. 2,585,444. G. M. Rothrock (to Du Pont). U.S. 2,585,499, Feb. 12. Production of shaped articles from acrylonitrile polymers.

CELLULOSE ESTERS. J. C. Thomas (to Du Pont). U.S. 2,585,516, Feb. 12. Impregnating cellulose with urea and ammonium sulfate and esterifying with acetic anhydride.

POLYMERS. P. R. Austin (to Du Pont). U.S. 2,585,529, Feb. 12. Polymers and copolymers of isopropenyl fluoride.

POLYMERS. D. D. Coffman (to Du Pont). U.S. 2,585,537, Feb. 12. Beta-methylene - beta - propiolactone copolymers.

ION EXCHANGE. H. D. Hartough, P. D. Caesar, and S. J. Lukasiewicz (to Socony-Vacuum). U.S. 2,585,652, February 12. Anion-exchange resins.

POLYMERS. P. Mosse (to Societe Rhodiaceta). U.S. 2,585,672, Feb. 12. Polyacrylonitrile dissolved in a mixture of dimethyl formamide and cyclohexanol.

PLASTICIZER. G. L. Doelling and K. H. Adams (to Mississippi Valley Research). U.S. 2,585,750, Feb. 12. A nitro-halo-diphenyl alkyl diether plasticizer for cellulose esters, phenolic resins, or vinyl resins.

RESINS. J. J. Padbury and E. L. Kropa (to American Cyanamid). U.S. 2,585,827, Feb. 12. Partially esterifying polymeric allyl alcohol with a benzoic acid and partially esterifying with tetrafluorosuccinic acid.

DENTURE. J. D. Schwartz. U.S. 2,585,857, February 12. A plastic denture.

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"Very satisfactory! Saves about 25%"

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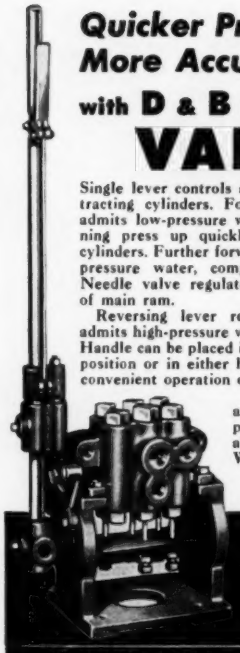

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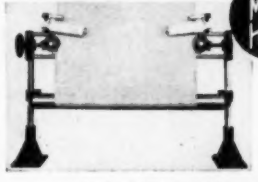

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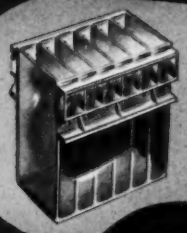

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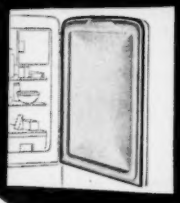

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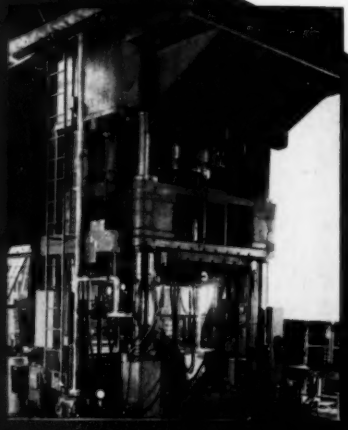

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NEW MACHINERY AND EQUIPMENT

TEMPLATES—Master copy templates to be used by machine engravers in standard engraving machines for work on plastics or metals are now available from H. P. Preis Engraving Machine Co., Hillside, N.J. The templates are made of brass or cold rolled steel, case hardened, for maximum wearing quality. On the standard model, the design or lettering is cut in a "V" shape to the required depth to suit the tracer but greater depths and double line "V" cuts are obtainable for special jobs. The template is usually made 2 to 4 times the size that the actual engraving is to occur.

ELECTRONIC HEATER—Designed especially for the molders of large plastic or rubber pieces, as a general purpose preheater, this "Thermal" Model 1000 has been introduced by W. T. LaRose & Assoc., Inc., Troy, N.Y. The electronic heater has a 15 kw. output of power at 65 mega-

cycles and operates on 230 volts or 460 volts, A C., power line supply. It is capable of preheating a 12-lb. load of plastic or rubber to approximately 250° F. in one minute. Larger loads of from 15 to 20 lb. can be accommodated with a longer time requirement. The machine has been built in accordance with the F.C.C. rules limiting "R.F. Radiations" and has a radiation strength of only .2 microvolts per meter at one mile.

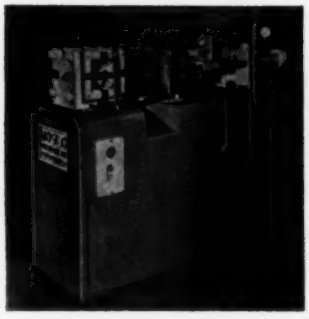
Specifications of the machine are: heatability, 10 lb. per min.; electrode size, 18 by 16 in.; maximum electrode opening, 6 in.; minimum electrode opening, 1½ in.; weight, 1000 lb.; and over-all dimensions, 34 in. wide, 36 in. deep, 57 in. high.

INDICATING PYROMETER CONTROLLER—Providing a convenient means of proportioning control for processing equipment such as plastic molding machines, ovens, furnaces, and kilns, a new model indicating pyrometer controller is now available from Wheelco Instruments Co., 847 West Harrison St., Chicago 7, Ill. The model incorporates a built-in unit to provide straight-line control by automatically reducing to a minimum the "on" and "off" variations of the control instrument above and below the preset control point. Thus, a hair-line control of the process variable is achieved. The instrument also compensates for the transfer lags inherent in all heat processing or process control systems.

The usual Capacitrol features of the line, such as thermocouple break protection, interchangeable voltages or selectro plugs, front accessibility, and plug-in terminal panels have been retained in this model. Dimensions are 7⅝ in. wide by 8⅛ in. high and about 7¾ in. deep. A wide range of standard scales in various thermocouple calibrations are available.

HORIZONTAL INJECTION MACHINE—Designed for the molding of small plastic parts, a new model ¾ oz. injection molding machine for thermoplastics has been announced by Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio. Clamping action is of the toggle type, hydraulically operated by means of a hand-operated valve. The hydraulic injection stroke is also operated by hand valve. Equipment on the machine includes an automatic feed mechanism; a safety gate with an electrical interlock; a simplified knockout plate for removing molded parts; and a built-in chute for discharging the finished parts.

The machine is powered by a 1½ hp. 220/440 volts, 3 phases, 60 cycle motor and control. Specifications are: operating temperature, 150° to 650° F.; plasticizing capacity, 7 lb. per hr.;



maximum pressure per sq. in., 13,250 lb.; injection stroke, 6 in.; mold size of 6 by 5 by 5⅛ in., which provides a maximum casting area of 6 sq. in. with maximum mold opening of 4 in.; and weight, 1000 pounds. Interchangeable cylinder assemblies can be provided at additional cost for molding nylon.

VINYL EMBOSSING MACHINE—Employing a new ceramic type radiant heater which reaches a maximum temperature on the surface of approximately 1600° F., a vinyl embossing machine is now available from John W. Odlin Co., Inc., Printers Bldg., Portland St., Worcester 8, Mass. The machine consists of a 2-roll let-off stand and a set of driven nip rolls to deliver the material from the unwind stand to a scray which is provided to allow the joining of additional rolls of film for continuous operation. The material is delivered to the carrier apron without any tension being applied and it is supported the entire distance under the radiant heaters to eliminate any possibility of its being distorted while it is subjected to high temperature.

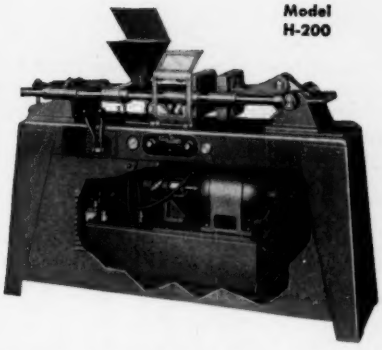
The embossing head consists of a welded steel frame supporting the rubber roll and the steel engraved

Model H-200

SEMI-AUTOMATIC INJECTION PRESS

2-oz. capacity. Van Dorn's engineering experience has scored again with this leader among all injection presses of its class. Its ultra-modern design insures faster operating cycles—up to 6 per minute. Push button controls are safe, simple and convenient. Accurate temperature regulation. Ruggedly built, compact and quiet.

Model H-200



Power Operated, Lever Controlled Presses—Available in 2-oz. or 1-oz. models. These profit-makers feature: Rugged all-welded construction; built-in safety devices; heating chamber with ample plasticizing capacity.

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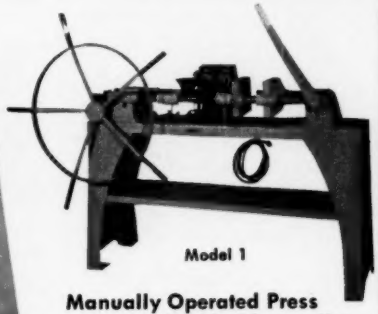
These presses mold practically all thermoplastics including nylon . . . Look over the Van Dorn presses and plastic equipment shown—*then write for detailed Bulletins on individual machines.*

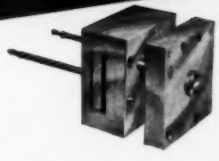


Model 1

Manually Operated Press
1-oz. capacity. Ideal for smaller jobs, experimental work, training.

Plastic Grinder
Grinds up rejects, waste, etc., for re-use. Ruggedly made, easily cleaned.

Model G-100



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roll, with a pneumatic lever pressure system allowing the maximum flexibility in varying operating pressures on both sides, independent of one another. The system is capable of obtaining operating pressures in excess of 300 lb. per lineal in. in the event they are needed. The unit also incorporates a cooling drum and a double slip belt center windup.

MASK WASHING MACHINE—Cleaning time is cut and more efficient operation is provided by a new mask washing machine brought out by Conforming Matrix Corp., Factories Bldg., Toledo 2, Ohio. Using 50 gallons of solvent, the machine employs 40 non-clogging nozzles to direct a powerful spray against both sides of the work. The company recommends the use of acetone, but a variety of other solvents, including Methyl Ethyl Ketone, Trichlorethylene (cold), and Pelron 235 and 240, can be used.

Design advantages of the machine are the splash proof lid construction; visual fluid level gage; pump intake strainer; adjustable mask suspension; drain for sludge removal with floor clearance for standard 5 gal. bucket; and pump with mechanical seals to eliminate packing replacement.

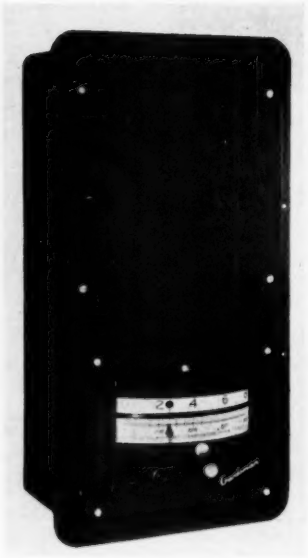
The machine weighs 325 lb. and is 37 by 24 by 47 inches. Mask cleaning area is 32 in. long by 15 in. high by 6 in. wide. The motor is a ½ hp. dual wound 110/120 volts, 60 cycle capacitor type.

INJECTION MOLDING MACHINE—Patterned after the company's larger injection molding machines, this new 16-oz. model has been announced by the Reed-Prentice Corp., 677 Cambridge St., Worcester 4, Mass. The machine, featuring rugged tie-bar construction, will plasticize 110 lb. of thermoplastic material per hour. The die platens have been increased to 35 by 40 in. to accommodate larger molds and provide casting area of 200 sq. inches. Another feature is a new mold closing mechanism that develops 400 tons locking pressure.

The stroke is a full 16 in. and the dry cycle time is 190 shots per hour. A special prefill arrangement to die closing cylinder speeds up the machine cycle. Other features include: easy access to control panel; sliding of movable die plate on four 4¾ in. diameter tie bars with additional support provided by hardened steel ways; mounting of heating cylinder on vertical ways to permit easy removal; convenient grouping of motor and hydraulic equipment at rear of machine; and easy access to the hopper by means of the rear steps and platform which also serve as protection for the 30 hp. main motor.

STEPLESS CONTROLLER—A new temperature control instrument (Stepless Controller Model JS) which has no relay or contactor and merely reduces the power input as the machine reaches the temperature desired is now available from the Taco West Corp., 525 North Noble St., Chicago 22, Ill. The instrument is recommended by Taco West Corp. instead of the company's Proportioning Model JP where the thermo system does not permit straight-line control.

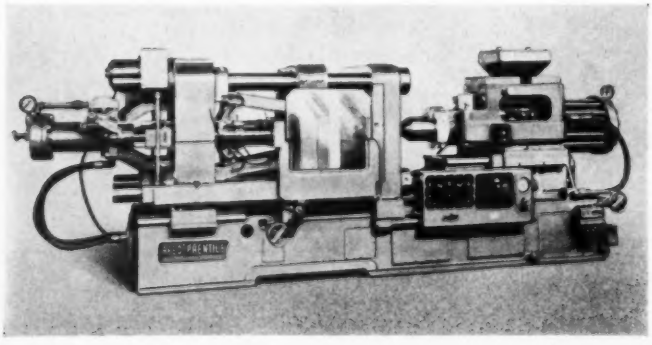
When using the instrument, temperature changes due to changes in line load or in the cycle of the machine, are not encountered. The use of manual control to eliminate slow warm-up is unnecessary with the controller.

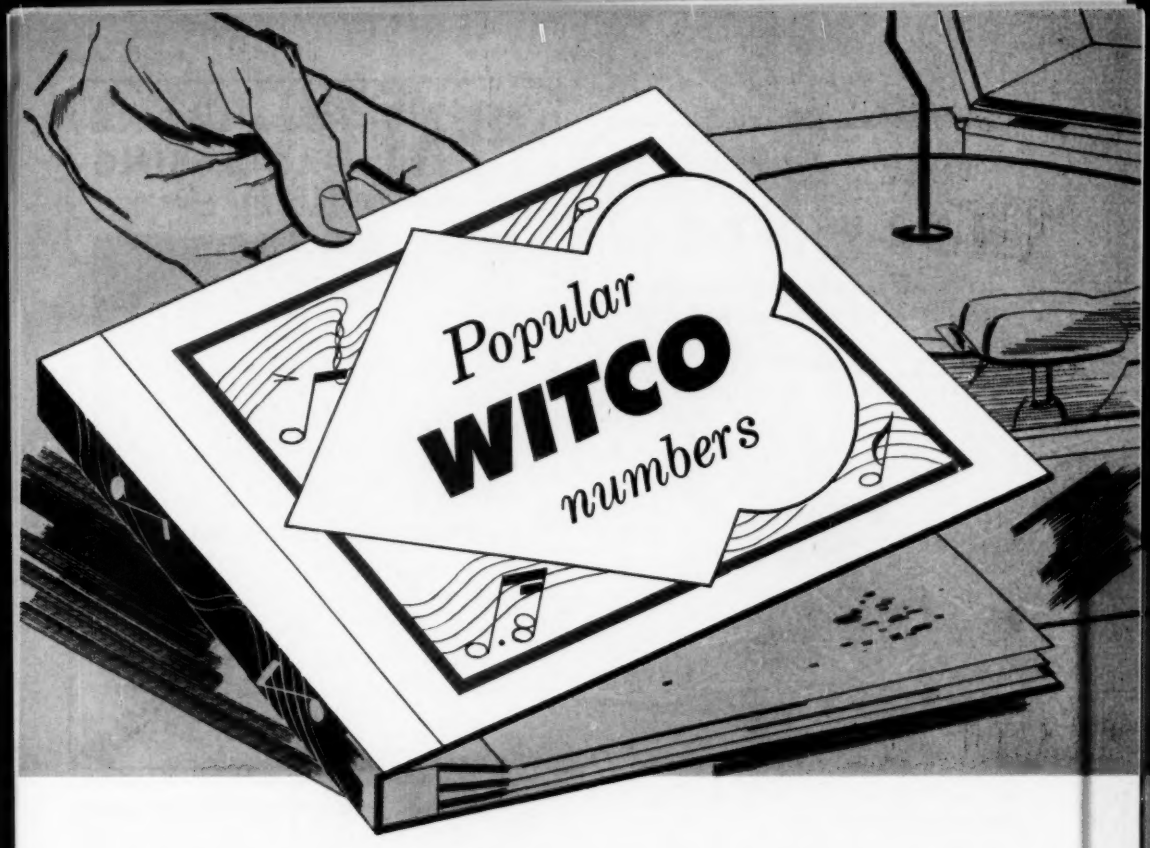


AUTOMATIC PREFORM PRESS—The Model 60 automatic preform press, manufactured by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa., is a high-production unit for making uniform preforms from high bulk factor materials. Hydraulic operation pressure is supplied by two self-contained Vickers vane pumps and accumulator. Valves are solenoid operated with either limit or pressure switches for control. The press and automatic feeder are interlocked so that each step of weighing, filling, pressing, and ejection occur automatically in sequence.

Specifications of the press are: maximum preform diameter, 4 in.; maximum core rod diameter, 2 in.; strokes per min., depending on pressure dwell, 6 to 10; main pressing ram, 40 tons; core rod ram, 1½ tons; side collector rams, 0.9 tons each; rear collector and die holder rams, 4 tons each; ejector ram, 2½ tons; maximum die space diameter, 7½ in.; working pressure, high, 1000 p.s.i., low, 350 p.s.i.; over-all dimensions, 38 by 38 by 72 in. high; and the approximate space volume needed for press, pumping unit, and feeder is 120 by 80 by 90 in. high.

Reed-Prentice 16-oz. injection molding machine features tie-bar construction





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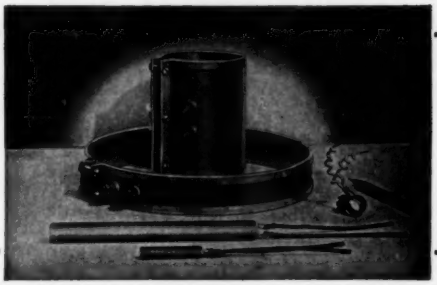

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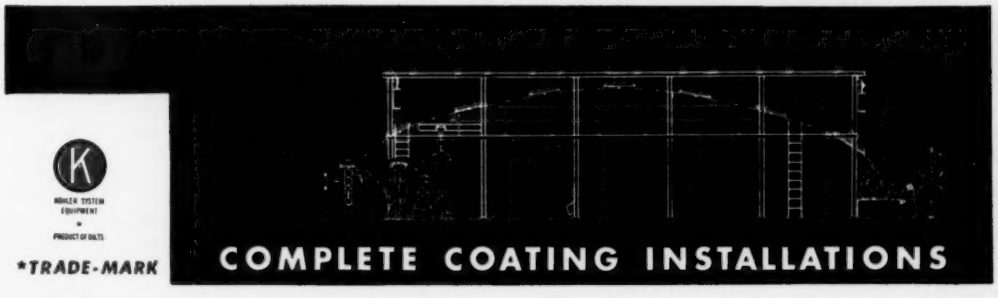

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Machinery and Equipment for Rubber Plastics. Vol. I—Primary Machinery and Equipment," compiled by R. G. Seaman and A. M. Merrill.

Published in 1952 by *India Rubber World*, 386 Fourth Ave., New York 16, N.Y. 804 pages. Price $15.00

Comprehensive engineering information on the primary machines and equipment used by the plastics and rubber industries is presented in this book. All machines and equipment are classified into 20 chapters, each of which contains a paper discussing design trends, construction principles, and applications and a description of the equipment as to size, type, specifications, operation, and maintenance. Included among the equipment covered are mixers; calenders and accessories; extruders; compression and transfer presses; injection presses; web coating and handling equipment; and special plastics machinery. The name of the manufacturer of each piece illustrated and his address are also listed.

"Symposium on Structural Sandwich Construction."

Published in 1952 by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 120 pages. Price $2.00

The eight papers and discussions comprising this book were presented at the 1951 annual meeting of the American Society for Testing Materials. The papers, illustrated with photographs, charts, and graphs and containing bibliographical references, have the following titles: Developments and Trends in Lightweight Composite Construction; Sandwich Construction in the Elastic Range; Strength of Sandwich Construction; Compressive and Torsional Instability of Sandwich Cylinders; Paper Honeycomb as a Core for Structural Sandwich Construction; Aluminum Honeycomb Sandwich Construction; Developments in Structural Sandwich Building Panels Having Inorganic Cores; and Fabrication Techniques for Structural Sandwich Constructions. Each of these papers was authored by a leading figure in the field.

"Color in Business, Science and Industry," by Dr. Deane B. Judd.

Published in 1952 by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. 401 pages. Price $6.50

Science and common sense are combined in this book to explain the subject of the psychophysics of color in terms of the purchase, production, and sales of commodities whose color has an important bearing on their usefulness and price. Among the topics covered are: the use of the spectrophotometer and the photoelectric colorimeter; fundamental tristimulus colorimetry; the Munsell and Ostwald color systems; color tolerances; and the proper way to determine the identities and amounts of the pigments and dyes in a colorant layer.

Plastics machinery—A roll coater, impregnator, and laminator is described in one 4-page bulletin and a plastic embosser is described in another 4-page bulletin. The roll coater's ability to permit a wide variety of coating, impregnating, and laminating operations are described and illustrated in bulletin No. 1000. The other (No. 1001) covers the advantages and the principal design and construction features of the plastic embosser. *John Waldron Corp., P. O. Box 791, New Brunswick, N.J.*

Centrifugal pump filmstrips—Three 35 mm. sound filmstrips on centrifugal pumps ae now available for showing before interested groups. The first film, "Covering All Angles," describes the selection of a pump and gives information required to figure its installation. "How and Why of Centrifugal Pumps" shows parts and nomenclature, theory of operation, measurement of characteristics, and interpretation of curves. The "Pump Maintenance" film illustrates how to set up a centrifugal pump, starting procedure, lubrication, packing, maintenance, mechanical seals, piping tips, and the keeping of operating records. The films have a running time of about 30 min. each. *Allis-Chalmers Mfg. Co., General Machinery Div., Milwaukee 1, Wis.*

Polyester resins for reinforced plastics—Characteristics of the company's many different polyester resins are described in this 30-page booklet. A summary of the properties—physical, chemical, and electrical—for each of the different resins is presented, together with applications for which many of the resins can be used. The booklet also presents data on U. S. Air Force Specifications, fillers, bench life of the resins, and a series of graphs demonstrating the basic characteristics of the resins. *Bakelite Co., Div. Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N.Y.*

Reagents—Price lists for the company's line of laboratory reagents and fine organic chemicals for laboratory or industrial use are available in this 4-page booklet. Information is also presented on special laboratory apparatus, including description and diagrams of a new titation flask for easier detection of end points. *Jasonols Chemi-Corp., 1085-87 Myrtle Ave., Brooklyn, N.Y.*

Modern hydraulic presses—Hot plate presses, plastic molding presses, metal working presses, and special purpose presses are illustrated in this 26-page company catalog, which covers each of the several types by size and construction features. A ram speed, pipe line flow chart is included in the booklet, as well as four handy tables—pressures per sq. in. of platen area; dimensions of steel pipe; line pressures; and circumferences and areas of circles. *Hydraulic Press Div., The French Oil Machinery Co., Piqua, Ohio.*

Coloring Lucite and Plexiglas—Description of techniques for coloring Lucite and Plexiglas and information as to the variety of colors obtainable are contained in a 4-page leaflet and a 2-page data sheet. The leaflet covers the advantages of self-coloring, the composition of the colors, and the methods of using them; the

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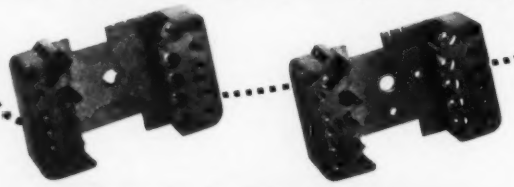

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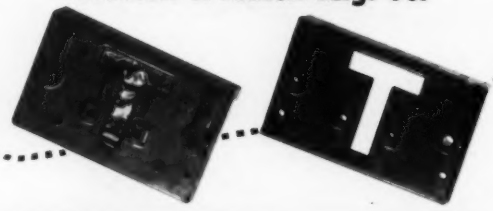

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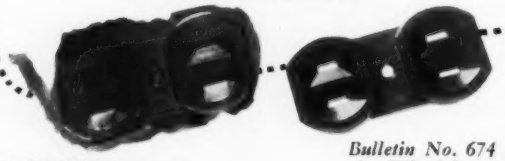

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data sheets list the style number for each color, the amount of each that would be needed for coloring 100 lb. of Lucite and Plexiglas, and the color cost per 1 lb. of plastic. *Ferro Corp., 4150 E. 56 St., Cleveland 5, Ohio.*

Protective coatings—Based on laboratory tests and practical field applications, this technical bulletin (No. 501) examines the resistance of synthetic resin protective coatings to some 69 corrosive chemicals in both concentrated and dilute form. *Prufcoat Laboratories, Inc., 50 East 42 St., New York 17, N. Y.*

Compounding Geon resins—Technical data on the factors and materials used in the compounding of Geon 101 and 101-EP straight polyvinyl chloride resins are contained in this 16-page service bulletin (No. G-8). Explanations as to specific purposes and functions are given for each of the ingredients—plasticizers, stabilizers, fillers, lubricants, and colors. A special feature of the bulletin is a series of formulations for specific applications in three categories—calendering, extrusion, and injection molding. The factors considered in the selection of each of the materials in the formulation, and the function each one has in the compound, are then analyzed. The bulletin is illustrated with photographs of actual operations and applications. *B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio.*

Semi-automatic compression molding presses—Each machine in the company's line of semi-automatic compression molding presses, ranging in capacity from 50 to 1200 tons, are described and individually illustrated in this 8-page bulletin and two supplementary data sheets (No. 640-C). Schematic drawings of one of the machines and a specification table are included in the explanation of general construction features, controls, and optional equipment. *Watson-Stillman Co., Roselle, N. J.*

Esters—More than 30 esters sold by the company, including ethyl acetate, isopropyl acetate, glycol diformate, diethyl maleate, dibutyl maleate, ethyl acrylate, and vinyl acetate are described as to uses, physical properties, and chemical make-up in this 36-page booklet (F-4766). The physical properties are covered in a

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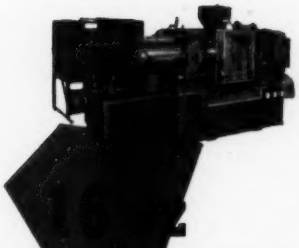
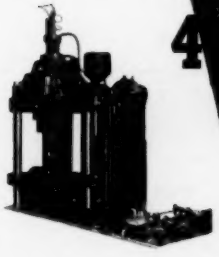
capable of pre- pounds of styrene per h vantages of larger presses u g Hendry Process, makes possible savings in operation and valuable floor space. Produces 150 square inches projected area 11 second cycle . . . 180 tons locking pressure. One person can operate battery of five 6 oz. presses. Complete plug-in of all electric controls eliminates necessity of disconnecting wires, provides ease of maintenance.**





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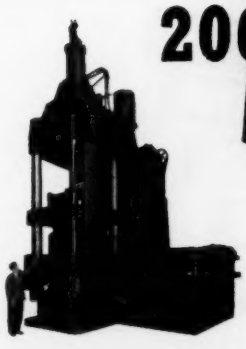
* Patents applied for

** Dependent upon part design, mold design & material



20 nolding machine with a ca- pounds of styrene per hour basis, utilizing the Hendry possible the molding of er plastic products. Utilizes fr t in conjunction with resistance hea upply constant viscosity material to the injection chamber. More projected area per ton clamping pressure . . . more strain-free moldings . . . less scrap. Injects uniformly plasticized material directly into mold without torpedos, auxiliary plungers and other supplementary devices. Potential capacity: 300 oz. at 45 second cycle with substitution of 300 oz. chamber.

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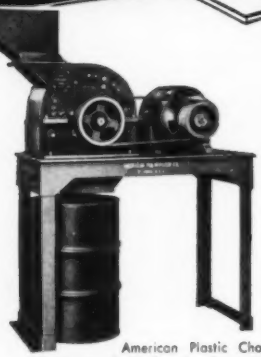

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series of charts offering information on dilution ratios, evaporation rates, vapor pressure, specific gravity, and water-solubility. Special features of the booklet are data pertaining to the commercial shipping of esters and a set of tables describing the control tests, both Standard ASTM methods and those developed by the company, for the determining of specifications. *Carbide and Carbon Chemicals Co., 30 East 42 St., New York 17, N. Y.*

Products and services—Operations of the several divisions and subsidiaries of the Emhart Mfg. Co. in combining research, development, and manufacturing facilities for solving industrial problems are explained in this 12-page booklet. The company's services to customers are also detailed. In the plastics and packaging field, the relationship of Plax Corp. to the other units is described. *Plax Corp., Box 1019, Hartford 1, Conn.*

Dry film thickness gage—Designed to measure non-magnetic protective and decorative coatings applied to magnetic surfaces, a new pocket-size dry film thickness gage is described in this 4-page brochure. The accuracy obtainable with the gage and the several advantages that are claimed for it are described and illustrated. An entire page of the brochure is devoted to full and complete instructions for the proper use of the gage in several of its applications. Included also is a list of scale ranges and prices. *Gardner Laboratory, Inc., Bethesda 14, Md.*

Industrial dryers—Each of several of the company's dryers for use in various industries, ranging from food to paper, are illustrated in this 4-page brochure. Included also is a description of the company's research facilities available to customers. *C. G. Sargent's Sons Corp., Graniteville, Mass.*

Butyl "Carbitol"—Physical and chemical properties, shipping data, and applications for Butyl "Carbitol" are described in this technical bulletin (F-7906). A short explanation is given of the chemical's primary applications, including its use for formulating nitro-cellulose lacquers and synthetic coatings; in printing and stamp pad inks; as a

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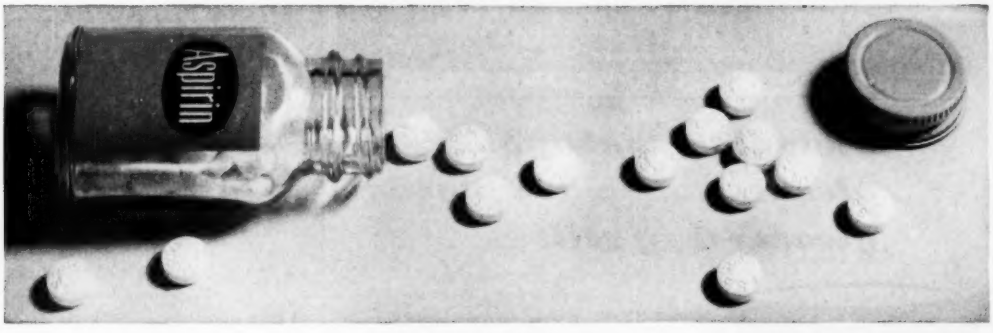

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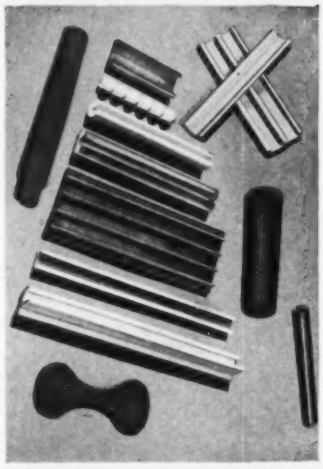

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Skills built up over the years in our plant produced the first practical method of continuous extrusion over wood (patents pending). Our extensive experience is at your command for the hard-to-get close tolerance shapes as well as simple rods, tubes, strips, ribbons, angles, channels in all thermoplastics.

Note the extruded interlocking sections pictured. Made of ethylcellulose, they form the rolling door of a desk file. The bobbins and handles shown were punched from extruded strip or ribbon stock. High capacity automatic punch presses and shears assure economical production of flat shapes. Complete tumbling and finishing equipment, and imprinting by offset methods, are among the extensive facilities at your service.

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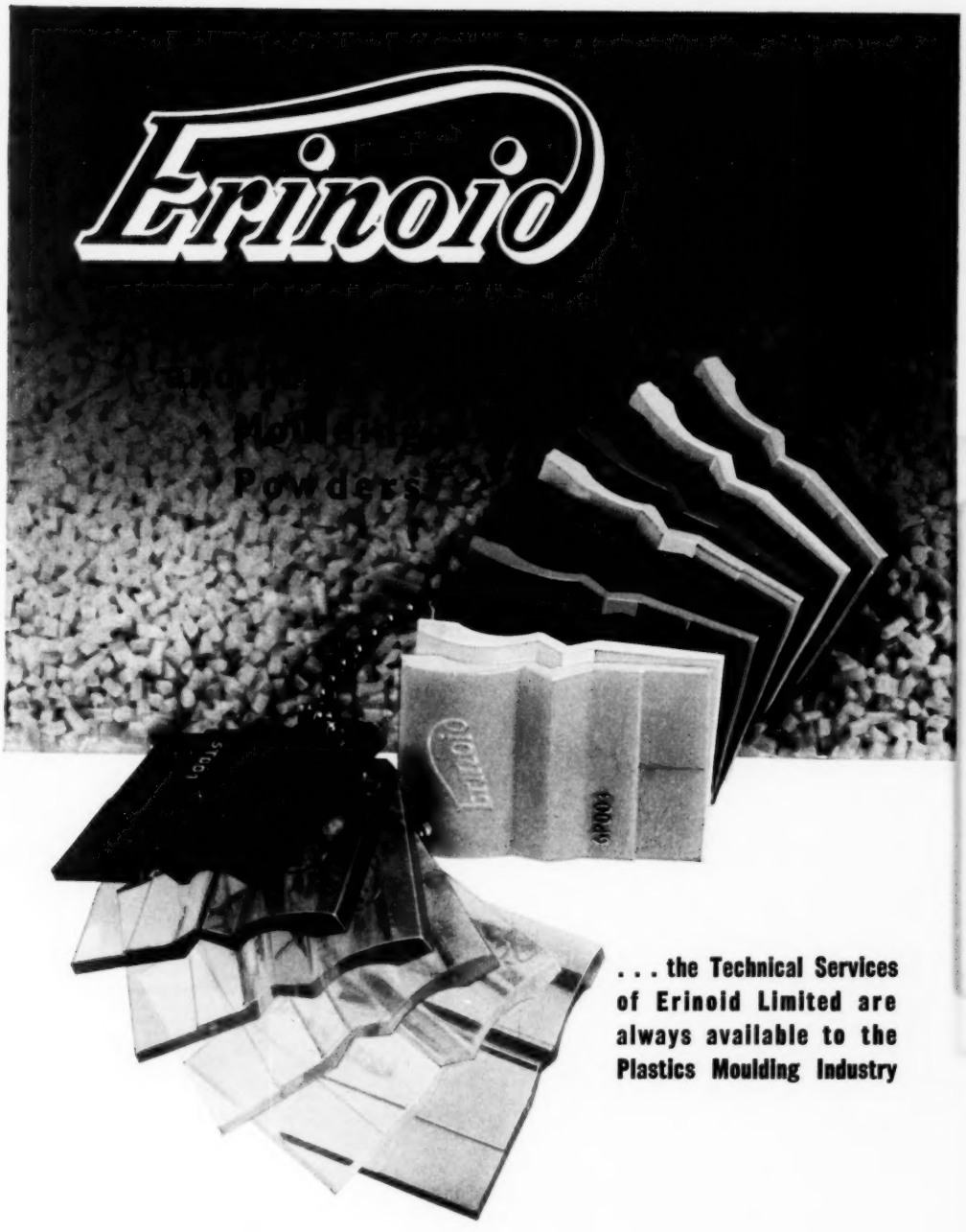
mutual solvent in specialty soaps, soluble oils, and textile oils; and as an intermediate in plasticizer manufacturing. *Carbide and Carbon Chemicals Co., 30 East 42 St., New York 17, N. Y.*

Fluorocarbon products—Tabular and graphic data on the physical, electrical, and chemical properties of products made from Teflon and Kel-F fluorocarbons are contained in this 4-page brochure. A list of applications of Compar, a modified polyvinyl alcohol elastomer, and silicone rubber is also given. *Resistoflex Corp., Belleville 9, N. J.*

What's a Silicone?—The answer to this question is given in terms of products and applications rather than physical and chemical properties. This 34-page booklet illustrates and describes silicone polishes, water repellents, fluids, release agents, lubricants, defoamers, protective coatings, electrical insulation, and Silastic, the company's silicone rubber. *Dow Corning Corp., Midland, Mich.*

N-butyl diethanolamine—Properties, shipping data, uses, and potential applications for N-butyl diethanolamine are described in technical bulletin F-7832. The chemical's three primary functions are outlined—for use as an intermediate in the preparation of synthetic resins; to introduce the tertiary amino group into a molecule; and for synthesizing various pharmaceuticals and dyestuffs. *Carbide and Carbon Chemicals Co., 30 East 42 St., New York 17, N. Y.*

Grinding mills—Intended for use by those in the rock products, cement, chemical, and mining industries, this 44-page bulletin (No. 07B6718A) offers a collection of engineering data on grinding mills. Containing information on parts, specifications, dimensions, and capacities, the bulletin suggests points to be considered in choosing the right mill from the six types available—rod, pebble, Ballpeb, ball, preliminator, and Compeb. Basic designs and grinding circuits are also covered. Special features are a series of equations and tables to be used as a guide in mill selection and a list of closed and open circuit grindability indices. *Allis-Chalmers Mfg. Co., 1163 South 70 St., Milwaukee, Wis.*



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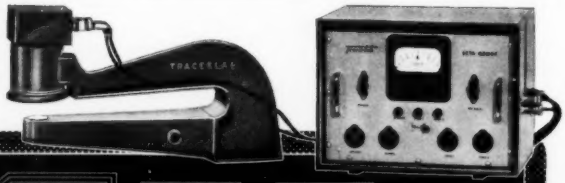
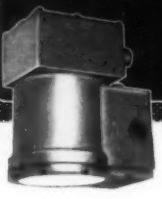


Multiple gauge installation for measurement of coating thickness, now in use in several industries.



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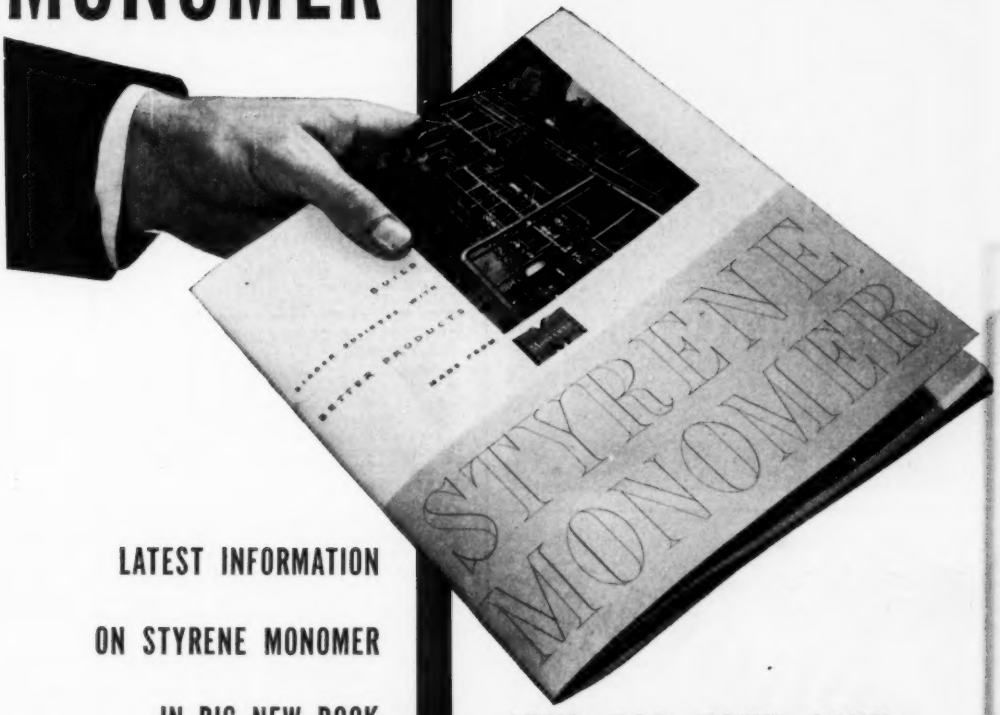
STYRENE MONOMER



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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION IN From Statistics Compiled

Materials	*Total p'd'n. 1952*	*Total sales 1952*
CELLULOSE PLASTICS:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, under 0.003 gage	2,518,290	2,007,507
0.003 gage and over	1,368,228	1,277,613
All other sheets, rods and tubes	1,012,061	802,270
Molding, extrusion materials	8,421,165	7,994,030
Nitrocellulose:		
Sheets	898,573	801,732
Rods and tubes	130,365	176,902
Other cellulose plastics[b]	1,525,747	1,351,491
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	10,384,510	6,355,271
Adhesive	6,322,002	5,744,577
Molding and casting materials[a]	33,033,629	25,111,842
Protective coatings (unmodified and modified except by rosin)	5,124,751	4,264,654
Miscellaneous uses	10,786,684	9,215,025
UREA AND MELAMINE RESINS:		
Adhesives	11,936,552	11,960,778
Textile-treating resins	6,032,233	5,946,927
Paper-treating resins	3,609,340	3,288,682
Protective coatings, modified and unmodified	3,321,484	2,801,519
Miscellaneous uses, including laminating and molding[c]	9,359,567	8,952,806
STYRENE RESINS:		
Molding materials[a]	42,270,453	30,985,305
Protective coatings, modified and unmodified	8,963,123	9,418,374
Miscellaneous uses	11,642,606	8,088,762
VINYL RESINS:[d] Total	82,691,072	64,582,886
Sheeting and film (resin content)[e]		25,858,494
Adhesives (resin content)		2,194,772
Textile and paper-treating resins (resin content)[f]		6,357,230
Molding and extrusion materials (resin content)		22,962,293
Protective coatings (resin content)		2,662,606
Miscellaneous uses (resin content)		4,547,491
COUMARONE-INDENE AND PETROLEUM POLYMER RESINS:	27,883,344	28,023,698
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a,g]	15,747,237	16,038,937
Protective coatings[h]	3,004,018	3,722,395
All other uses[i]	13,275,597	14,105,023

* Dry basis unless otherwise specified. † Revised. [a] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Production statistics by uses are not representative, as end-use may not be known at the time of manufacture. Therefore, only statistics on total produc-

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fida sales in which title passes to the purchaser.

POUNDS* FOR JANUARY, 1952, AND FEBRUARY, 1952 by U. S. Tariff Commission

January 1952		*February 1952*	
Production	*Sales*	*Production*	*Sales*
1,733,512	1,170,774	784,778	836,733
668,300	641,591	699,928	636,022
555,249	445,542	456,812	356,733
4,242,693	3,940,962	4,178,472	4,053,078
459,309	410,699	439,264	391,033
61,986	87,877	68,379	89,025
734,155	621,683	791,592	729,808
5,236,223	3,373,866	5,148,287	2,981,405
3,185,878	2,744,973	3,136,124	2,999,604
17,665,501	13,789,567	15,368,128	11,322,275
2,742,403	2,116,830	2,382,348	2,147,824
5,564,202	4,905,027	5,216,482	4,309,998
5,850,621	5,797,393	6,085,931	6,163,385
3,237,336	3,043,563	2,794,897	2,903,364
1,814,794	1,682,623	1,794,546	1,606,059
1,654,283	1,362,654	1,667,201	1,438,865
5,102,276	4,739,664	4,257,291	4,213,142
21,753,357	15,121,314	20,517,096	15,863,991
4,277,624	4,734,760	4,685,499	4,683,614
5,641,762	4,454,139	6,000,844	3,634,623
43,445,684	33,346,630	39,245,388	31,236,256
	13,124,744		12,733,750
	1,121,870		1,072,902
	3,030,523		3,326,707
	11,771,864		11,190,429
	1,521,934		1,140,672
	2,775,695		1,771,796
13,929,571	13,717,987	13,953,773	14,305,711
8,432,905	7,803,693	7,314,332	8,235,244
1,573,203	1,696,916	1,430,815	2,025,479
7,427,244	7,401,649	5,848,353	6,703,374

tion are given. * Prior to January 1951, statistics were given on the basis of total weight. [c] Includes data for spreader and calendering-type resins. [d] Includes data for acrylic, polyethylene, nylon, and others. [b] Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective coating resins. [f] Includes data for acrylic, resin modifications, nylon, silicone, and other plastics and resins for miscellaneous uses.

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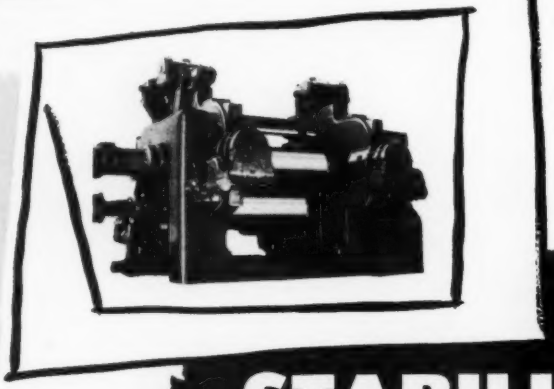


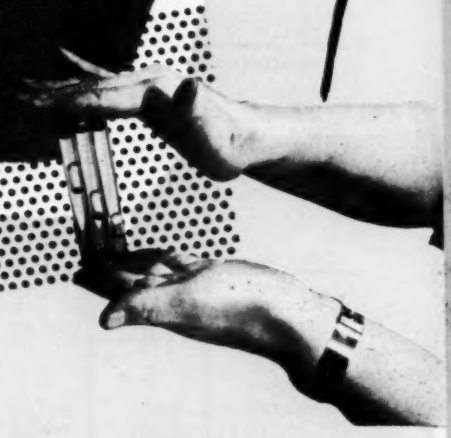
STABILIZERS

The backbone of vinyl compounding, stabilizers have occupied a place of corresponding importance at ADVANCE.

Ever since ADVANCE pioneered the commercial development of metallo-organic stabilizers for vinyl resins, its research and experimentation in the field have been continuous and expanding.

As a result, ADVANCE today offers a most complete line of stabilizers to inhibit light and heat degradation in all types of vinyl film and sheeting, and for rigid vinyl formulations.

The outstanding properties and applications of the leading ADVANCE stabilizers are listed at the right. However, special problems in compounding will be given the full attention of our skilled laboratory technicians. *Inquire today for a complete list of* ADVANCE STABILIZERS, *additional data or special assistance — without obligation, of course.*



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ADVANCE *leads in* Vinyl Stabilization

Our latest exclusive developments include the extremely effective organo-tin stabilizers (patented*) described below.

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STABILIZER OM-10* — A new, exclusive development, it is the outstanding organo-tin stabilizer where glass clarity is desired in both flexible and rigid film; gives outstanding heat and light stability in all types of vinyl resins.

STABILIZER 52* — An organo-tin stabilizer that gives outstanding clarity in vinyl compounds with exceptional heat and light stability.

STABILIZER 3* — Our original polymeric organo-tin stabilizer, for good heat and light stability, excellent transparency in all vinyl resins. Relatively non-toxic. Useful in blown film applications. Imparts excellent light stability in low ratios to most stabilizer systems.

STABILIZER BC-12 — A co-precipitated barium-cadmium laurate with accurate control of the barium-cadmium ratio. A popular stabilizer for most vinyl resin compounds as it gives maximum heat and light stability. Excellent for stabilization in the presence of phosphate plasticizers. Usual ratio 2 to 3% on the resin. Heat and light stability are further increased by the use of 1% Stabilizer CH-14.

STABILIZER CH-14 — Chelating type, non-metallic, non-reactive; it is not itself a stabilizer but greatly increases heat and light stability of barium-cadmium stabilizers, such as our BC-12, or cadmium stabilizers, such as our VL-3 or JCL. Improves heat and light stability of lead stabilized compounds.

*U.S. Patents No. 2692256 & Pend.

The stabilizers listed above are a small representative selection of the most widely used Advance Stabilizers. There is an Advance Stabilizer to meet almost every formulation requirement, and special needs will be met by our technical research staff.

Advance

Pacific Coast S.P.I. Conference

THE Ninth Annual Conference of the Pacific Coast Section of S.P.I. was held at the Hotel del Coronado, Coronado, Calif., March 26 through 28.

The program for the first day of the conference, Wednesday, March 26, was entirely social. The annual golf tournament was held in the morning at Rancho Santa Fe and a late luncheon followed the tournament. No evening meeting was scheduled.

Thursday

The official opening and welcoming ceremonies took place at the morning meeting on Thursday, March 27. The program, entitled "This Is Your S.P.I.," featured the following speakers: Gordon Brown, president of S.P.I., William T. Cruse, executive vice-president of S.P.I., and Deane Severance, Pacific Coast Chairman.

At the luncheon meeting on Thursday, Rear Admiral Leslie M. Gehres, U.S.N. (Ret.), spoke on "Preparedness, 30 Years Later."

Three papers were delivered at the Thursday afternoon session. Edward E. Beauchamp of Lane Wells Co., national vice-president of the Industrial Advertisers Association, spoke on "Advertising and Merchandising." This address was followed by one on "Future Field of Vinyl Resins," by O. E. Isenburg, field service manager, B. F. Goodrich Chemical Co. The session ended with a paper on "Closed Mold Molding Technique," by Edward F. Borro, development engineer, Durez Plastics & Chemicals, Inc.

Friday

Both the morning and afternoon sessions on Friday, March 28, were devoted to a series of papers on "Plastics in Aircraft and Guided Missiles." James Lampman, Northrup Aircraft, opened the morning session with a paper on "Present Materials." This was followed by a speech on "Future Requirements" by Don Hatch, Hughes Aircraft. The third paper, on the subject of "Plastics Tooling," was delivered by Jake Walkey, Lockheed Aircraft. The morning session concluded with a speech on "Procurement Aspects" by P. Paxton, Convair.

The luncheon session on Friday was devoted to the introduction and installation of the officers of the Pacific Coast Section elected for 1952-53. The new officers are: chairman, Lee T. Bordner, Sierra Electric & Mfg. Co.; vice chairman, Leslie M. Swanson, Electric Specialties Co.; secretary, Joe Jayne, Plas-Tex Corp.; treasurer, Barton H. Thompson, Molded Products Co.

The afternoon session of Friday opened with a paper on "New Developments in the Transparent Enclosure Materials," by Carl Lemons, Douglas Aircraft. The final speech of the conference was delivered by Robert Whann, North American Aviation. His subject was "Temperature Requirements for Molding and Laminating Materials."

The conference closed with a late afternoon cocktail party sponsored by the materials and machinery manufacturers and a banquet with dinner dancing on Friday night.

The mold mark shown above has become increasingly familiar to buyers of plastic products . . . it's the symbol that identifies products molded by Cambridge Molded Plastics.

Ever since it was first introduced, it has been associated with quality injection and compression molded plastics that are notable for outstanding design, excellent molding, and fine finishing.

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737 N. Michigan Avenue
Chicago 11, Illinois
Phone: WHitehall 4-4888

Foam Insulated Container

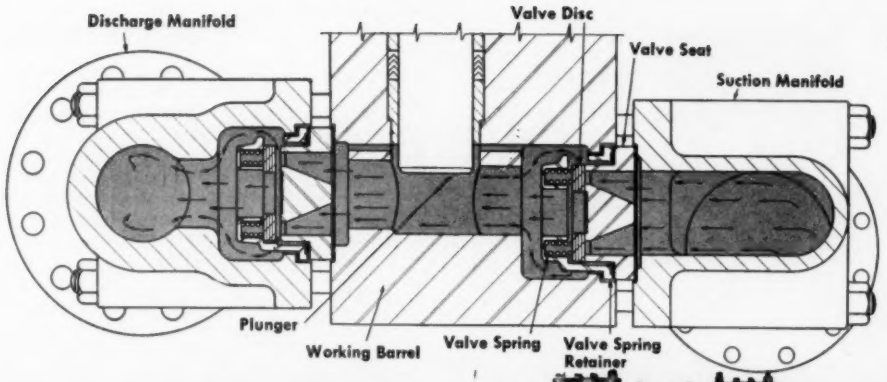
Photo courtesy Bakelite Co.

Cross section of container insulated with 3-in. thick phenolic foam slabs

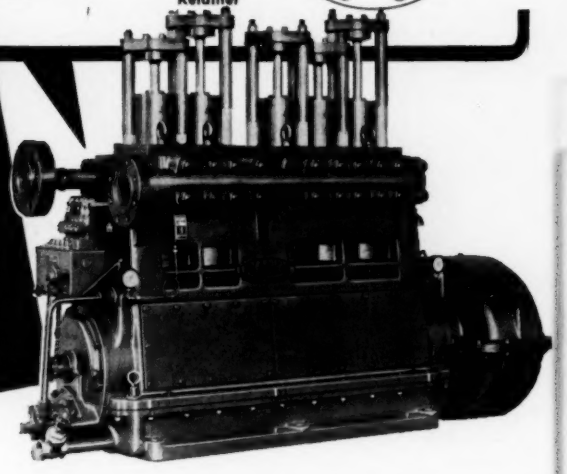
FOAMED phenolic has recently been adopted as an insulating material in the lightweight, low cost, reusable containers for the air shipment of whole blood. Because of the insulating properties of the foamed phenolic material, the containers, cooled by chopped ice, can be maintained at a temperature between 33 and 49° F. for a period of 24 hr. without reicing. The new six-unit shipping containers are produced by The Bailey Engineering Co., Ramsey, N.J., and consist of 3-in. thicknesses of phenolic foam sandwiched between inner and outer boxes made of 250-lb. corrugated kraft board.

The foamed phenolic is prepared by mixing specially formulated phenolic resins with foaming agents and acidic catalysts. It is a spongy, lightweight material that has a low core density of 1 lb. per cu. ft. and a very low rate of thermal conductivity (0.20 to 0.23). The phenolic resin is foamed by Thermafoam Corp., Metuchen, N.J., from Bakelite Co. material and supplied in slabs that are easily cut to size.

The blood-filled bottles are carried in two aluminum-dipped wire racks inside the container. The racks grasp the bottles firmly and are proportioned so that no shifting is possible when the 1-gal. metal can holding the ice is placed inside. A glass fiber cushioning pad, supplied by Gustin-Bacon Mfg. Co., Kansas City, Mo., is placed over the bottles.



ENGINEERS: Check these points of Aldrich Direct Flow Design



Aldrich engineers eliminated two right-angle turns in the fluid-end. Now, liquid passes from suction to discharge manifold in a *straight line.* That gave the Direct Flow Pump its name, and set up a whole new concept of pumps, pumping, and pump maintenance. It all adds up as follows:

☐ **Increased operating speeds**—you get whatever volume and pressure you need *from a smaller, lighter, more compact pump.*

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☐ **Changeable plunger sizes**—in many cases it is only necessary to add new plungers, glands, throat bushings and packing *to the same fluid-end.*

☐ **Drive direct**—by connection to synchronous engine type motor or internal combustion engine; also with integral speed reducer or V-belts.

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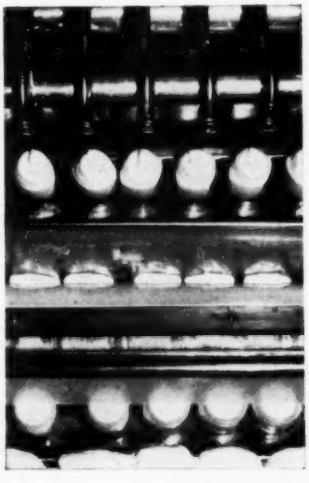
Wiper Blades

PRODUCTION economies were effected by Pond's Extract Co., Clinton, Conn., by replacing rubber with polyethylene in the wiping blade of a device used to remove the excess from and smooth the top of face cream in jars after they have been filled on packaging lines.

The wiping apparatus operates like a water wheel. Two wiping blades, each 1/16 in. thick and 4 in. wide, are notched between metal strips. The filled jars pass beneath the apparatus on a conveyor belt. The metal mount rotates; each blade wipes off alternate rows of jars on its downward swing and carries the excess face cream about three-quarters of its full circle until it comes in contact with a flange that takes off the excess cream and deposits it in a moving trough. The trough returns the preparation to the filling hopper where it is used again.

The polyethylene blades, supplied in sheet form by Plax Corp., Hartford, Conn., perform better and last longer than the cloth-inserted rubber sheets formerly used. The latter became softened and eroded by continual contact with face cream and had to be serviced frequently. The new blades are unaffected by alcohols, hydrocarbons, and have a low rate of water absorption.

Double-edged polyethylene wiping blade (foreground) removes excess face cream (on top blade) from filled jars (top)



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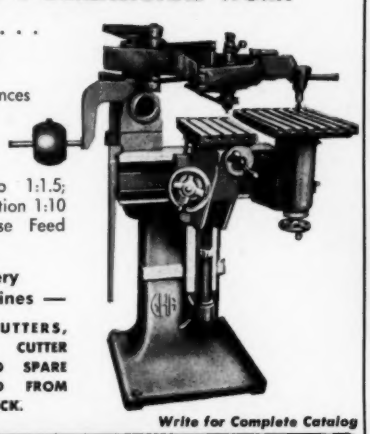

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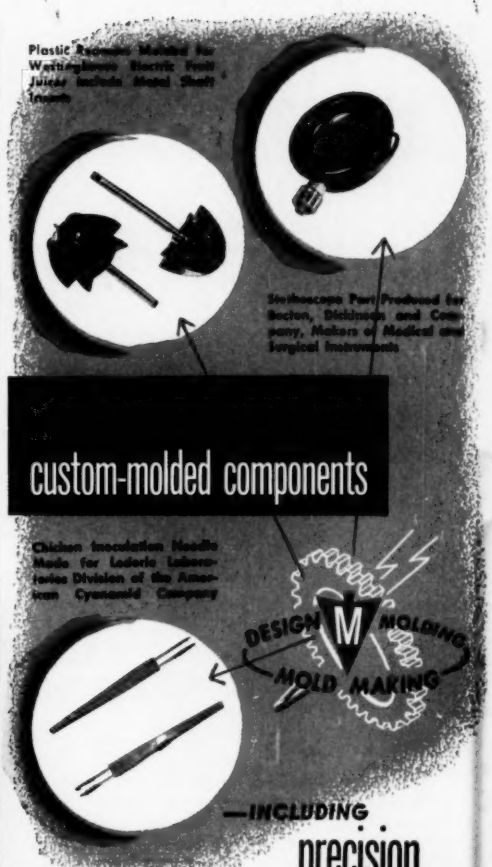
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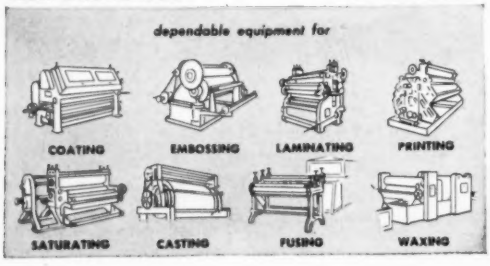

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FOUNDER OF COLUMBIA PROTEKTOSITE
Joseph Patrick Brunetti
AN INDUSTRIALIST OF IMAGINATION AND VISION
WHO BY HIS DEVOTED SERVICE AND COURAGEOUS
LEADERSHIP IN THE ARTS AND SCIENCE OF MASS
PRODUCED THERMO-PLASTICS CONTRIBUTED TO
THE AMERICAN WAY OF LIFE
Curtiss Wright Corporation

Presentation of a plaque (left) is made (above) to Joseph Patrick Brunetti (right), founder of Columbia Protektosite Co. Attending the affair were (left to right) Joseph V. Miccio, general manager Columbia Div.; Roy T. Hurley, president Curtiss-Wright; Mrs. Brunetti

Injection Molder Honored

THE founder of the Columbia Protektosite Co., Joseph Patrick Brunetti, was honored recently by the Curtiss-Wright Corp., which purchased Columbia in June 1951. Mr. Brunetti was presented with a bronze plaque in the offices of Roy T. Hurley, president of Curtiss-Wright and was later tendered a luncheon at the Pennington Club, Passaic, N.J.

Mr. Brunetti founded Columbia Protektosite in 1923 and built it into one of the largest injection molding companies in the country. He was the principal in the firm until he sold out to Curtiss-Wright last year. The company is now a division of Curtiss-Wright. Mr. Brunetti is retired but is retained as a consultant by Curtiss-Wright.

The plaque has a profile bust of Mr. Brunetti in bronze attached to a clear plastic bevelled panel. It is inscribed "In recognition to the original founder of Columbia Protektosite, Joseph Patrick Brunetti, an industrialist of imagination and vision who by his devoted service and courageous leadership in the arts and science of mass produced thermoplastics, contributed to the American way of life. Curtiss Wright Corporation."

The presentation ceremony was a surprise to Mr. Brunetti. Those present included: Mrs. Brunetti; Mr. Hurley, who made the presentation; Joseph V. Miccio, general manager of Columbia; Sam Bell, sales manager of Columbia; Nicholas Baldanza, chief engineer of Columbia; Michael Maguth, president of Maguth Industries, Inc.; Thomas Lawlor, former mayor of Carlstadt now associated with Smith & Nichols Co.; and Ronald Gall and Frank Buchner of Curtiss-Wright.

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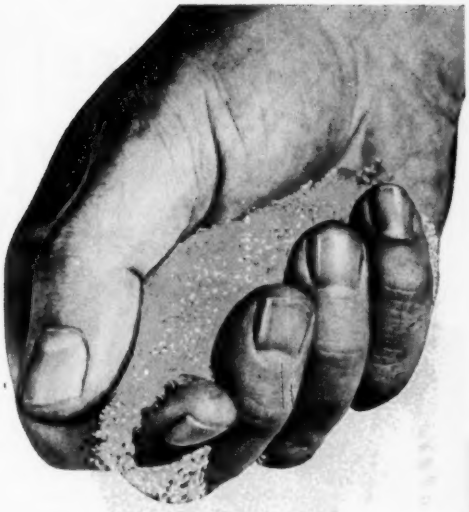

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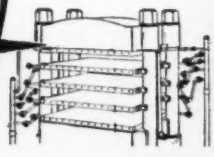

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Polyethylene Air Filter

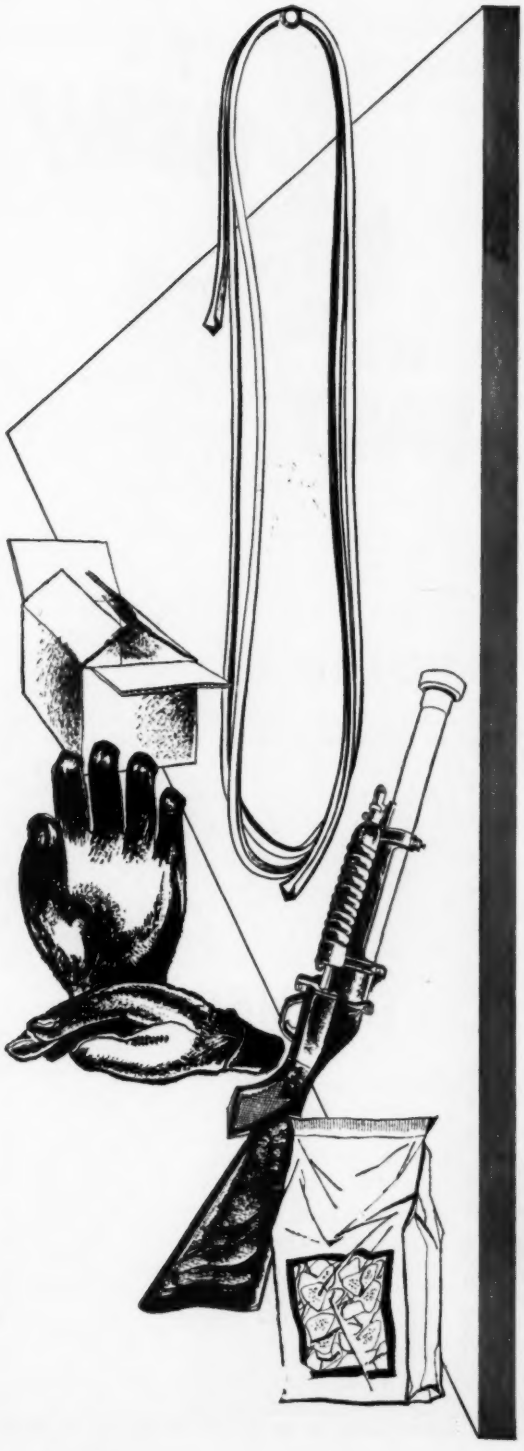
DIELECTRIC properties of polyethylene have been utilized in an air filter for forced-draft hot air furnaces and air conditioning systems. When the plastic material is exposed to a current of air, friction develops and the polyethylene picks up an electrostatic charge. This charge attracts and retains the finest particles of dust, soot, or smoke which may be suspended in the air. Thus the filter, developed in the Research Laboratory of The Goodyear Tire & Rubber Co., Akron, Ohio, is a self-charging unit.

For use in the filter, polyethylene film is shredded and formed into a porous mass about 2 in. thick which is held in a metal frame. A thin metal grille over the front and back of the filter encases the shredded material.

Laboratory tests conducted over the past several years indicate that the polyethylene filter is from two to four times more efficient than oil-coated or other conventional type filters which collect dust particles on their surfaces by impingement; the polyethylene is electrostatically charged throughout its thickness.

An added advantage of this new filter is that it can be cleaned simply by rinsing in cold water—no detergent is required. After washing, the filter is drained for just a few minutes and then restored to service while still damp. The filter can be repeatedly cleaned without loss of performance.

Shredded polyethylene film, encased in metal frame, forms washable air filter



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Monsanto ortho-Nitrobiphenyl is an efficient plasticizer in molded, extruded, plastisol or organosol compounds. It may be employed as a primary plasticizer or as an extender. ONB is low in price . . . and available.

IN VINYLS, the low cost of ONB enables the formulation of compounds that are better than rubber in color and in resistance to grease and abrasion. Ortho-Nitrobiphenyl may be extended by the addition of oil-type plasticizers, further lowering costs. ONB is an excellent plasticizer for glove coatings, gasketing materials, protective molded coatings and other molded or extruded industrial products. ONB is useful as a processing aid in the manufacture of vinyl shellac or Formvar records.

IN VINYL ACETATE ADHESIVES, ONB is a low-cost primary plasticizer. It can be used in high concentrations to retain toughness and adhesion. Its low cost permits the production of economical adhesives for tabbing cements, bookbinding cements, cardboard box sealing, for bonding cellulose acetate to paper for packages with acetate windows.

IN CELLULOSICS, ortho-Nitrobiphenyl serves as the plasticizer for dark-colored products. Such items include molded toys, toy gun stocks and similar products. Ortho-Nitrobiphenyl is an excellent plasticizer for reclaimed acetate.

For further information, contact the nearest Monsanto Sales Office or write for a copy of Monsanto Technical Bulletin No. O-78. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Mo.

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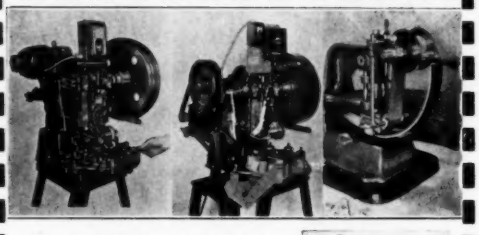

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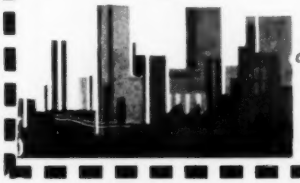

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Cellulosic Boning

FIBROUS cellulosic boning material, developed at the request of manufacturers of strapless brassieres, is now being made by Anchor Plastics Co., New York, N.Y. The new product, called Bonar, has an excellent flex life, can survive bends as sharp as 360°, can be sewn through without being weakened, is resistant to perspiration, and stands up under repeated laundering.

Development of Bonar is the result of dissatisfaction with conventional boning materials. Chicken quill composition had an unpleasant odor. Steel strips, which cannot be sewn through, snap if bent to extreme angles and require a special fabricating process.

Extruded cellulosic boning material is flexible, can be sewn through by needle

In order to produce a strong, flexible boning that can be pierced by a sewing needle, Anchor found that the material had to have a fibrous structure. Employing the principle that a fibrous product is formed when two thermoplastic, fiber-forming compositions are extruded simultaneously, Anchor extruded a mixture of cellulose acetate and cellulose acetate butyrate. These two cellulosics, plasticizing temperatures of which are not too far apart, yielded a fibrous extrusion that met the requirement of the job.

The mixture is extruded as flat strips or as rods. If the latter are twisted while they are still soft, the fibrils are extended spirally, making a product more resistant to splitting. They can be flattened by rollers.

Production Increased From 100 to 650 Parts Per Hour

DRILLING COSTS CUT 80%

To get high production quickly in special machining operations is a problem plastic manufacturers run into every day. Machining by hand on standard machine tools is too slow, too costly. Expensive, custom-built special purpose machines are impractical.

But if you have a tool engineer with a little imagination, you can build many special purpose machines right in your own tool room, quickly and inexpensively.

The machine shown below was tool room designed and built. Three standard drill press heads, three Bellows "Controlled-Air-Power" Drill Press Feeds, and one Bellows Rotary Feed Table made a machine that jumped drilling production 650%; cut drilling costs 80%.

A little ingenuity and Bellows "Controlled-Air-Power" Devices go a long way towards solving plastic machining problems.

Simple

Tool-room-built Machine Pays Big Dividends in Drilling Eight Holes in Phenolic Part

Would you like the complete story on this and other plastic machining operations? Write for Fact File FF49-832 and for a copy of "Faster, Safer, Better Production." Free on request. Address Dept. MP 652, The Bellows Co., Akron 9, Ohio.

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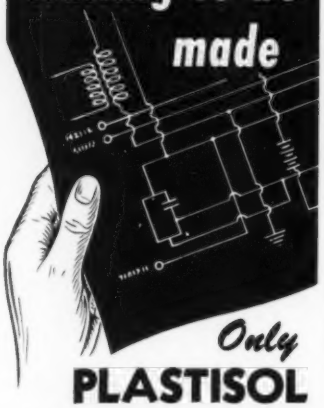
For products waiting to be made



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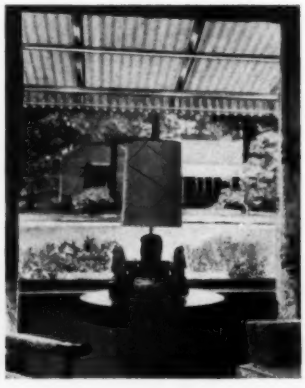
Translucent awnings, formed from reinforced polyester sheet, are light weight for ease of installation and strong enough to withstand high winds and heavy snow or ice loads

Reinforced Polyester Awnings

TRANSLUCENT, reinforced polyester awnings offer home owners all-weather protection—they diffuse sunlight, cutting the glare without loss of light; and in rough weather they remain permanently anchored in aluminum frames, resisting stress and vibrations without danger of splitting or buckling.

Ray-O-Lite Corp., Atlanta, Ga., has developed and is assembling these awnings from reinforced polyester sheet supplied by Corrulux Corp., Houston, Texas. Each sheet is 33½ in. wide and 12 ft. long—the most convenient size for economical cutting—and has 2½-in. standard corrugations, crinkle finished on both sides. The reinforced panels, sizes of which vary with the end use demanded, are set into polished and anodized extruded aluminum frames. They are fastened with stainless steel and aluminum sheet metal and machine screws.

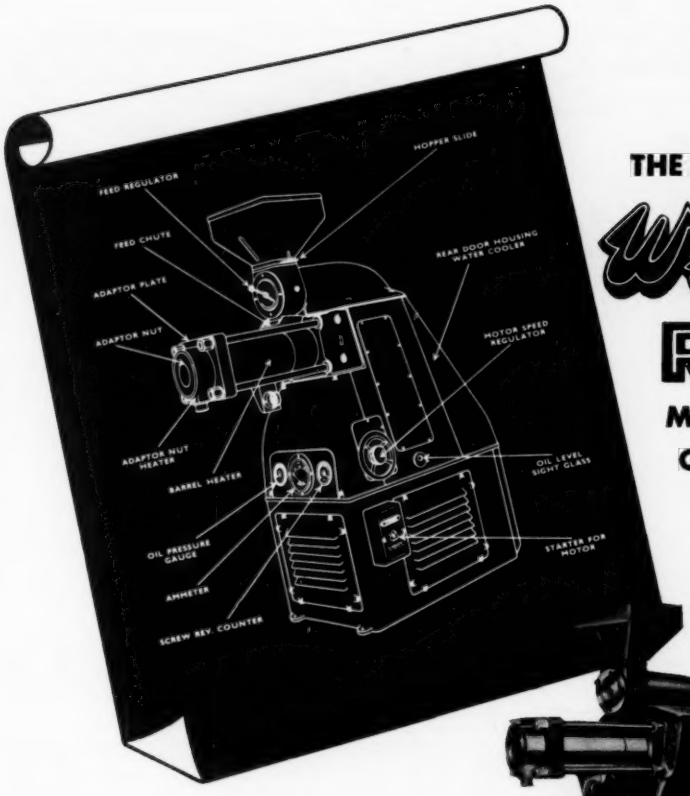
Awning panels, anchored in an aluminum frame, diffuse sunlight, cut glare



The finished awnings combine lightness of weight with strength. Their light weight facilitates installation, and their strength assures support against high winds, heavy snow, or accumulated ice loads. They will remain unaffected by any atmospheric conditions to which they may be subject—humidity, rot, mildew, salt water, intense sunlight, frost, or heat. In addition, the awnings are very easy to clean and they require no refinishing.

All Ray-O-Lite installations up to the present time have been custom made because size is such a variable factor. These installations have included single and multiple windows, screened-in porches, entrances, terraces, and patios. However, Ray-O-Lite is planning to fabricate stock sizes of door hoods in the near future because panel sizes of these hoods are relatively uniform and will fit almost all commercially available doors.

The awnings are available in seven pastel shades of translucent reinforced polyester.



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MULTI-SCREW COMPOUNDER EXTRUDER

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- COLOURS
- RECLAIMS SCRAP

SPECIFICATION

Number of screws	2
Diameters of screws	3.15", 3.35" & 3.54"
Speeds—Infinitely variable between	4-13 r.p.m.
Motor (Variable speed)	5 H.P.
Heating	3-4.5 KW/hour.
Average output (dependent on material)	22-65 lbs./hour.
Dimensions of machine:	
Floor space	4'6" x 2'4"
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Net weight of machine	2,240 lbs.
Gross weight of machine	2,774 lbs.

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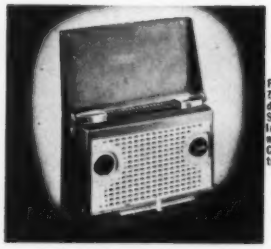
THE S & F SHOWCASE



Flat coil handle of Zenith Portable Radio is fabricated at Schwab & Frank, Inc. — on automatic machinery — from Cellulose Acetate extrusion.

Flexible Coil Handle for Zenith Radio

Serving a list of distinguished clients, S & F invites YOUR inquiry on any plastics assignment . . . commercial or industrial. Complete facilities and a design staff to serve you promptly.

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Sinko Produces Nylon Parts That Give Years of Economical, Trouble-Free Service

Pictured are 3 Sinko Nylon cabinet rollers and a drawer skid-block that are being used successfully by several leading manufacturers of fine kitchen equipment. Sinko Nylon was selected after a series of exhaustive tests had proven its superiority in every respect. In one experiment a small drawer equipped with Sinko Nylon rollers was loaded and automatically operated the equivalent of a normal 200 years service. Upon examination the Sinko Nylon rollers showed little sign of wear.

You too should investigate the many advantages Sinko Nylon offers, among them—resistance to wear and to shock loads, to moisture, chemicals and to temperature; and its smooth-gliding, self-lubricating properties.

SINKO MOLDS ALL THERMOPLASTICS FROM 4 TO 60 OZ.

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ELECTRONIC HEATING

...FOR COMPRESSION, TRANSFER AND AUTOMATIC MOLDING

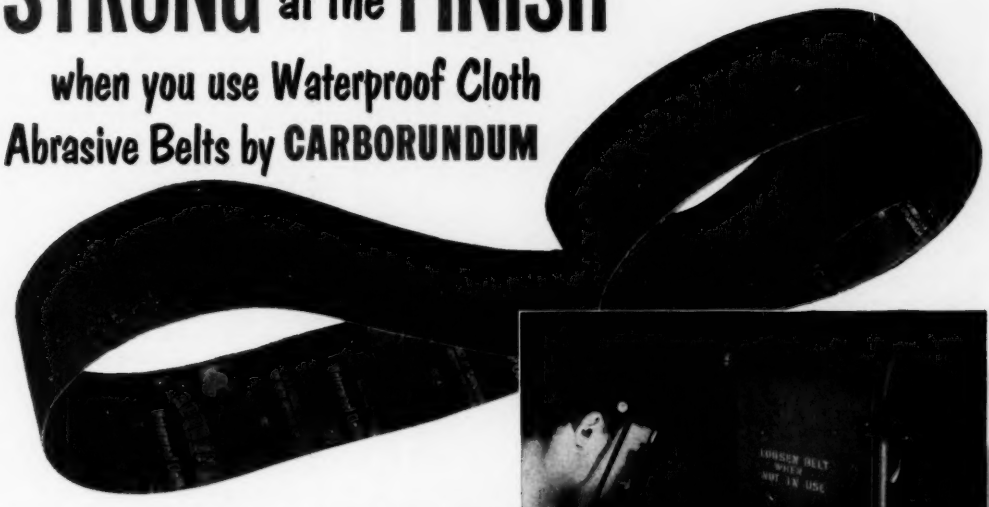
...FOR EXTRUSION AND DRYING PROCESSES

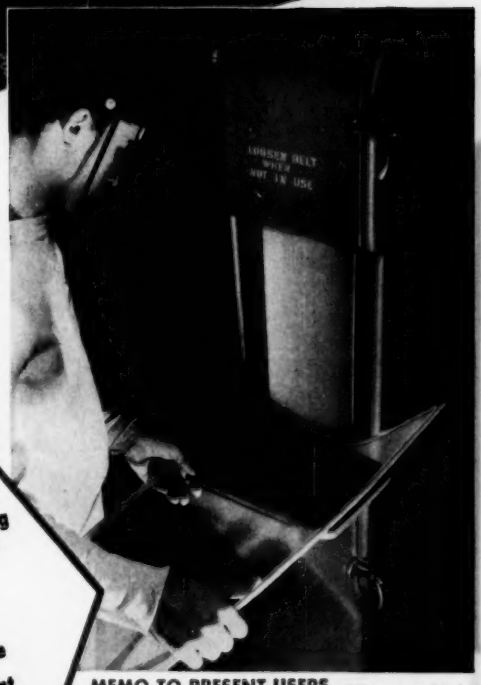
Before you buy any size of preheater, look first to **W. T. LA ROSE & ASSOCIATES, Inc.**

TROY, N. Y.

STRONG at the FINISH

when you use Waterproof Cloth Abrasive Belts by CARBORUNDUM





At the finish—where rejects can turn profit into loss—is where you can rely on Waterproof Cloth Abrasive Belts by CARBORUNDUM. Leading plastic molders do just that, for they know these belts are especially developed for wet sanding of plastics and other ductile materials subject to plastic flow.

In five important ways, Belts by CARBORUNDUM are outstanding. They're built with just one aim in view—to give you a better finish, in greater volume, at lower cost.

Week after week, more and more custom molders are making a trial test of Waterproof Cloth Abrasive Belts by CARBORUNDUM—and are permanently convinced. How about you? Why not call in the CARBORUNDUM man or distributor salesman today?

- **Smooth-running splices—no "splice throb" to cause breakage**
- **Pre-stretched resin-filled cloth backing—high resistance to "wet-stretch"—less down-time for tension adjusting**
- **Clean, fast, cool cutting action—pre-buff finishes in record time**
- **Hard, sharp silicon carbide grain—high, continuous cutting rate**
- **Long, wear-resistant belt life**

MEMO TO PRESENT USERS of Waterproof Belts by CARBORUNDUM: Have you looked into the profit possibilities in using Abrasive Cutting-Off Wheels by CARBORUNDUM? Superior for either dry or wet work... usually faster than steel saws...permit closer tolerances ...give smoother cuts, thus often by-pass extra finishing operations...conserve the material being cut, since they cut with a thinner kerf. Ask the CARBORUNDUM representative for details, or write Dept. MP 82-53.

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offers ALL abrasive products ...to give you the proper ONE

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82-53

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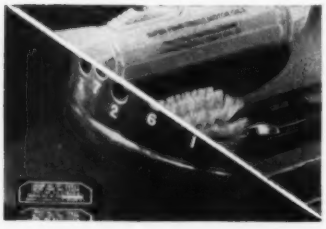

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Drum Extension

OBTAINING uniform distribution of the particles in a drum of molding compound after shipping is a problem that often troubles molders. In spite of precautions taken by materials manufacturers, the larger particles tend to separate from the smaller ones during handling.

American Cyanamid Co. has developed a solution to this problem—which any materials supplier can put into practice himself. At the Bound Brook, N.J., plant, Leverpak-Fiber drums for shipping Beetle urea and Melmac melamine are treated in the following manner: the center of the standard cover for the drums (one is 26¾ in. high and 20 in. in diameter; the other is 30⅝ in. high and 18¾ in. in diameter) is first cut out. Then a stainless steel cylindrical extension is fastened in the hole. This extension then replaces the drum cover before tumbling. Extensions are 3½ in. high for the large drum, 7½ in. for the small.

Use of these extensions obviates the difficulties encountered in tumbling in the conventional way, which was to remove part of the drum's contents, thereby subjecting it to contamination and exposure. By attaching an extension, such as the one described above, sufficient volume is added to the drum so that efficient tumbling can be achieved.

Extension adds volume to shipping drum for tumbling molding powder particles

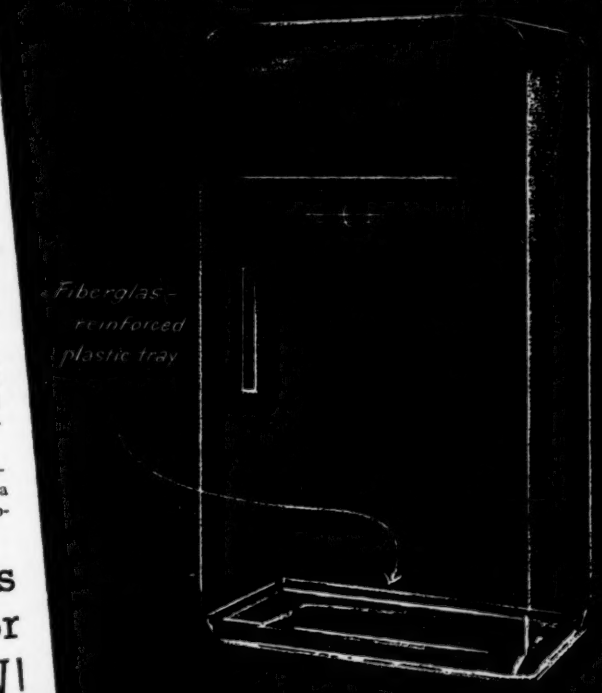
from TODAY'S production...

Here's how appliance makers turned an idea into production reality with *Fiberglas-reinforced plastics.*

The Problem: to produce evaporator pans for automatic defrosting refrigerators that will take the hard knocks of shipping and handling, and withstand constant exposure to water.

Solution: Pans molded of Fiberglas-reinforced plastics. Weight for weight, stronger than metal and impervious to water and other corrosive materials, Fiberglas reinforcements did the job.

Result: low-cost, easy-to-fabricate evaporator pans that play a significant part in efficient automatic defrosting.



often comes a design for TOMORROW!

Take plastics with their ease of fabrication, their unlimited colorability . . . add Fiberglas reinforcing material, with its tremendous strength, its resistance to oils, acids and the elements, and here's the result:

A material that opens whole new fields of product design, such as seats, fenders, and motor hoods for farm tractors, outboard motor housing, automotive parts, an infinite number of products yet to be.

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Whatever your product is, if it is expected to withstand sunlight during its service life it should be tested in an Atlas Fade-Ometer.

Because the Fade-Ometer accurately reproduces natural sunlight in your laboratory, it can tell you (in just a fraction of the time required by actual outdoor exposure) whether your product will fade, whether its finish will crack or peel, or how it will react to certain conditions of temperature and humidity. Information of this type has been proved invaluable in the development of a new product or simply for controlling production line quality of an existing one.

From 21 to 126 samples can be simultaneously tested in the Fade-Ometer. Operation of the machine is completely automatic, and it may safely be left in unattended continuous operation overnight.

Extensively used to comply with government and civilian specifications.

Write for your copy of the Fade-Ometer catalog

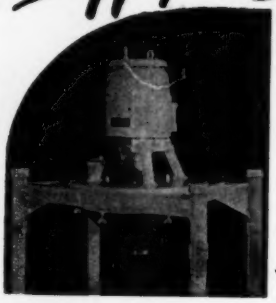
ATLAS ELECTRIC DEVICES COMPANY

361 West Superior St., Chicago 10, Ill.

Manufacturers of accelerated testing equipment for more than a quarter of a century.

WEATHER-OMETERS · LAUNDER-OMETERS · FADE-OMETERS

NEW High Speed MIXER



- Reduces Pre-Mixing Time
- Provides Complete, Uniform Dispersion of Plastics Ingredients
- Improves Color Blending

The "ENTOLETER" Mixer provides the simplest, most economical method of producing a homogeneous mix. It is easy to install and operate. Requires only 12 cubic feet of space; yet can produce a finished mix at rates up to 200 lbs. a minute. It is adaptable to either batch or continuous mixing. Entoleter Division, The Safety Car Heating & Lighting Co., Inc., 1195 Dixwell Ave., New Haven 4, Conn.

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Courtesy Monsanto Chemical Co.

Acetate display box is shipped flat, hand-assembled in 5 sec. by end user

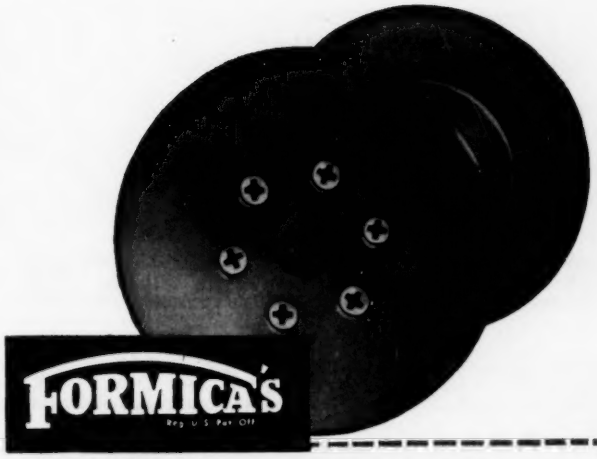
Display Box

SHIPPING and assembly costs of cellulose acetate display packages are substantially reduced with the use of a new box which can be shipped and stored flat, and then assembled without machinery in less than five seconds. The new Flat-Pak display box is manufactured by Acetate Box Corp., Brooklyn, N.Y., with acetate sheet supplied by Monsanto.

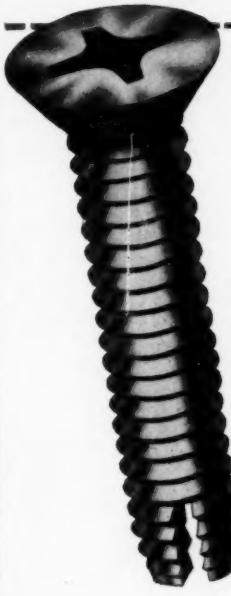
The assembled package is semi-cylindrical in shape. The cover is a transparent sheet of Vuepak cellulose acetate and the base and ends are cardboard. A patented interlocking feature of the cardboard base permits Flat-Pak to be formed into a rigid container by three quick motions of the hand.

Because of the unique design of the box, it has several economic advantages over similar "glamour packages." A lighter weight sheet of cellulose acetate can be used without danger of breakage. The cost of the package is claimed to be 25% lower than any similar set-up box of cellulose acetate now on the market. Space required for shipping and storage is one-tenth as much as is needed for the same number of standard boxes, and the lower bulk means lower shipping costs. In addition, the speed and ease of assembly facilitates filling the package and requires a minimum of hand labor.

Flat-Paks are available in a variety of sizes and the interlocking cardboard bottoms and sides are made in a wide range of colors.

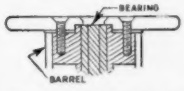


NEW GYROTEX BOBBIN
"discovers" HOLTITE'S
TYPE "G" TAP SCREWS



NEW PRODUCTS DEMAND NEW METHODS

Designed, engineered and produced by Formica, the Gyrotex Bobbin meets the strenuous requirements of the new synthetic yarns. It stands up under the tremendous pressures developed by Nylon and Orlon.



Formica Gyrotex Bobbins feature heads which are attached to the flange of the aluminum tube with Holtite-Phillips Type "G" Tap Screws and have no contact with the bearing or the barrel — eliminating closing of the BORE, or other distortions in the bobbin.

CONTINENTAL CONTRIBUTES

The Continental Screw Company contributes to this Formica achievement in the textile field. Its Type "G" Tap Screws are stronger than ordinary fasteners. Consisting of Phillips hardened (heat treated) steel, they are *self-tapping*, with patented slotted points. They automatically eliminate expensive tapping operations.

CONSULT CONTINENTAL — and save

When you have unusual fastening problems that call for fasteners engineered to the application — call in Continental. Get the facts. Write Department A. Continental Screw Company, New Bedford, Mass.

— You can count on Continental

CONTINENTAL SCREW COMPANY INC. 1904

IMPORTANT ANNOUNCEMENT

to companies that sell to the plastics field

Advertising space reservations are now being accepted for the 1952 Modern Plastics Encyclopedia.

The new edition, to be published in September, will be circulated to the full audience of Modern Plastics magazine. For complete details and rates write to

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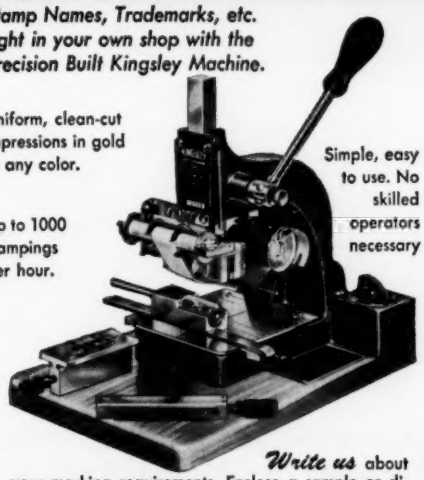

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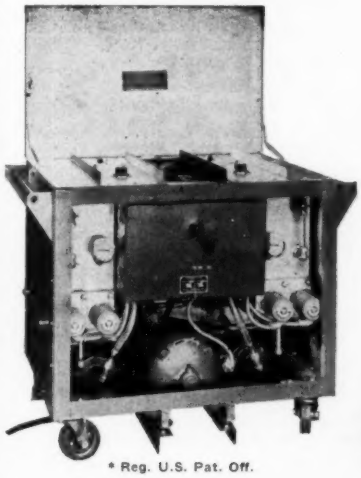
THERMOLATOR*, pictured below, is the original, and the standard of Mold Temperature Control equipment.



* Reg. U.S. Pat. Off.

A word to management on

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Speed up your production and ADD PROFIT! Reduce scrap and rejects and ADD PROFIT! Experience in use of THERMOLATOR in some of America's largest Injection Molding plants has proven THERMOLATOR will do BOTH . . . for YOU! The simple fact is . . . you need a THERMOLATOR for every press. How much longer can you afford to wait?

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KENTUCKY COLOR & CHEMICAL CO.
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General Office and Works: Louisville, Ky.
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Film Viewers

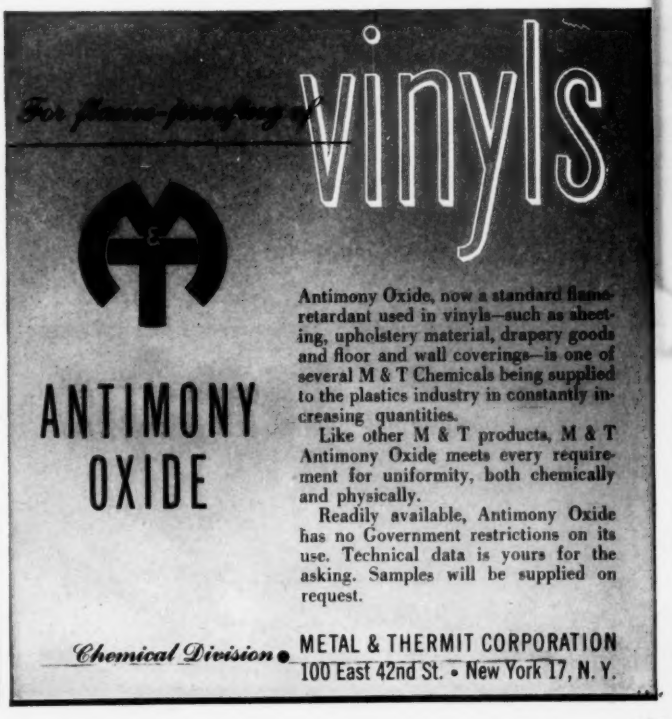
(Continued from pp. 81-3)

side. The function of this part is to admit glare-free light into the viewer—an effect achieved by means of the frosted finish on the bottom surface of the diffuser. Through sandblasting of the die, this surface is produced directly on the molded part, eliminating the need for any blasting operation on the diffuser itself. Molding this component and its frame in one piece instead of using frosted glass reduced weight and eliminated the need for any extra assembly operations.

Right and left halves of the viewer housing follow the same general design except that the right side has an upper slot in which slides are inserted for viewing and the two lower slots for the film storage magazine. The slotted metal parts which lock the storage compartment at top and bottom slide in molded channels and are secured to the side of the case by means of molded lugs which are flattened at the end with a heated tool. A molded stop on the case limits the movement of the metal slides. The lower slide carries an index mark which may be lined up with a small ridge on the case, adjusting the bottom clearance to permit only one slide to be withdrawn at a time.

The case halves are run in a two-cavity mold on a 4- or 6-oz. injection press. The matched flow pattern apparent in the variegated colors results from identical pin-point gating on the back side of the case halves. The light diffuser and the magnifying lens support are molded in another two-cavity die. One of the principal problems involved in molding the case was the large number of inaccessible spots in the housing. These resulted from the various slots and recesses required in each half of the case, and involved complex vertical shut-offs along with extremely close mold tolerances. No side cores are required in the molding of the Mico-Vue case halves.

On the front of the case, the assembly joint is concealed by vertical fluting near the bottom of he unit. A small slot in the left side of the case permits film strips to be fed directly through the device for viewing. The Mico-Vue name is hot stamped on the front of the case in gold after assembly operation.—END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Antimony Oxide, now a standard flame-retardant used in vinyls—such as sheeting, upholstery material, drapery goods and floor and wall coverings—is one of several M & T Chemicals being supplied to the plastics industry in constantly increasing quantities.
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1830 SOUTH 54th AVENUE • CHICAGO 50, ILLINOIS

Vinyl Strip

(*Continued from p. 79*)

cure due to metal shortages) are easily pushed out of position during the pouring operation. This frequently makes it necessary to shovel away the concrete and straighten the joint seal, increasing labor and material costs. In addition, rubber and copper seals must be joined by costly and time-consuming vulcanizing and welding operations.

With the Harza Labyrinth plastic waterstop, installation costs are practically zero. The plastic extrusion is simply nailed in position on the inside of the form so that concrete can flow into the finger-like recesses. After the first pour has been made the form is stripped, leaving a corresponding set of grooves into which concrete from the next pour can flow. Even following subsequent shrinkage of the concrete, there is no way for water to seep past the joint.

The vinyl sealing strip also offers superior aging characteristics, immunity to alkalies and acids in the concentrations found around cement work, and ability to withstand the temperature changes produced when concrete is poured and sets up. Joining or welding the thermoplastic strips is easily done at the installation site by applying sufficient heat to the loose ends with an electrically heated knife or gasoline torch, eliminating waste of short pieces. Such joints are as strong as the material itself. The vinyl seal is easy to cut and miter on the job, even with a pocket knife.

In cross section, the vinyl waterstop consists of a central rib backed by U-shaped grooves. Weighing 2.02 lb. per ft., the finished seal is rolled into 100-ft. strips which are cut to length as desired on the job. A typical pour at the Guayabo project consisted of a horizontal block of concrete 50 ft. square and 5 ft. thick. It is estimated that approximately 27,000 lineal ft., or more than 54,000 lb., of the vinyl waterstop was required for this project.

Waterseals, Inc., is also bringing out a smaller, less costly vinyl extrusion of the same general design for applications not involving direct water pressure. It will be used for reservoirs, sewage plants, foundation walls, etc.—END

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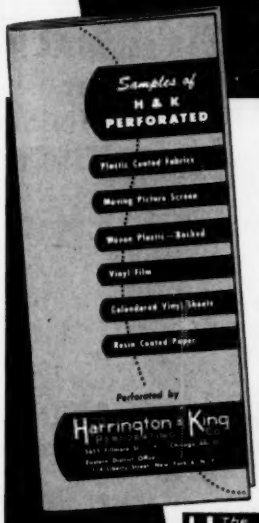
The PERFORATING of PLASTICS



This folder of perforated swatches includes samples of various forms of plastics available as coated fabrics, vinyl sheet and film, resin coated paper and woven plastic fibers—all perforated with various sizes and spacings of holes.

The perforating provides ventilation and air escape for upholstery, sound escape for moving picture screens, light transmission for advertising signs as well as for decorative and many industrial purposes.

With 68 years of experience we are prepared to meet the requirements of the plastic industry when perforating is required.

Send for this folder of samples —gratis.

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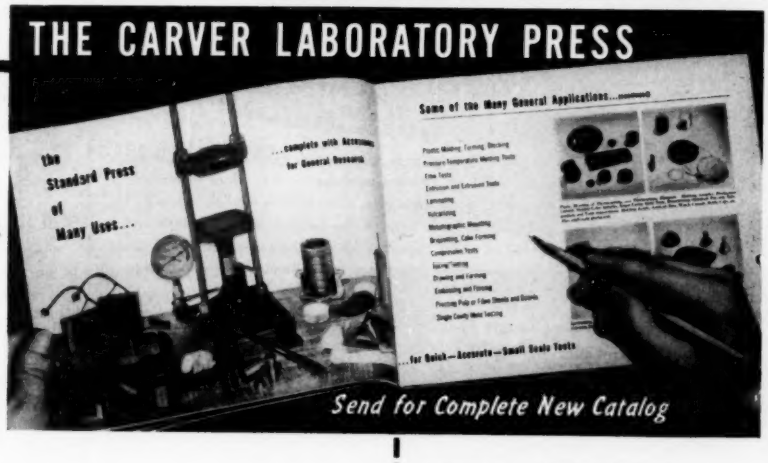
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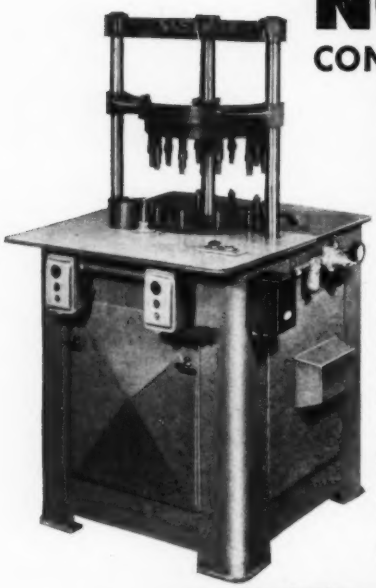

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This new Nash assures positive, uniform finishing operations on circular mouldings and parts. Operation of the machine is automatic . . . *reduces labor costs* and *produces uniform results superior to hand methods.*

- Continuous Automatic Cycling.
- Rapid travel *to feed inpoint*, 0 to 50 feet per minute.
- Slow approach, *feed in to dwell*, 0 to 20 feet per minute.
- Control at stop position *dwell* 1 to 15 seconds.

NASH 103-B AUTOMATIC FLASH LATHE with Intermittent Motion on Turret

This Nash 103-B is a ten-spindle machine, with intermittent motion operation, *permitting finishing operations on circular mouldings or any other cylindrical or turned articles requiring a feed and dwell drive.* The variable feed and spindle speed features allow independent selection of the proper feed and spindle speed . . . also control speed of turret travel to the dwell position and period of time during dwell. Movement of stations is air powered, hydraulically checked and electrically controlled.

A variety of tooling can be mounted on the back table which has three outlets for motor connection. Tooling can consist of *Buffing Wheels, Abrasive or Buffing Belts, Crimping Rollers, Revolving Knives for height trimming, Grooving Knives, Grinding Wheel,* etc.

Spindles have a *variable speed of 700 to 2,000 R.P.M.* and are stationary in loading and ejection zone.

Diameter range up to 4½". Height adjustment up to 8".

WRITE FOR FURTHER DETAILS. *We also build the Nash No. 103 Continuous Motion Machine, and the Nash No. 116 Rotary Edger for plastic dinnerware.*

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2370 N. 30th Street • Milwaukee 10, Wisconsin

PMCA

(Continued from pp. 109-20)

the PMCA was acetone. The three specimens tested in this material showed no weight changes but were structurally affected. A network of very fine cracks appeared on the surfaces and appeared to extend internally and completely through the material. These fine cracks crossed each other in a random pattern and enclosed areas of roughly 1/16 to 1/64 sq. inch. Also noticeable was an internal fish-scale effect. These scales were scattered throughout the material and though of varying shape were about ¼ in. in length. These internal scales started at a surface crack and then sloped off through the material.

The results for the change in thickness of the materials, as given in Table X, seem rather high. This is due primarily to the fact that with the limit of measurement of 0.001 in., a change in thickness of 0.001 in. gives a result of approximately 0.8% change. Thus, a reading of 0.001 in. in measuring the change in thickness of one of the three specimens, will result in an average value in the table of 0.27 percent. For other dimensions, greater measurement accuracy gives more reliable results.

Water Absorption

The water absorption test was made in accordance with Method 7031 of Federal Specification L-P-406a. Results are given in Table XI.

Heat Stability

The heat stability was determined in accordance with Method 7051 of Federal Specification L-P-406a. This test determines the short-time stability at elevated temperatures of plastics containing chlorine and therefore is not applicable to the Plexiglas II material. The average value obtained with the three specimens of PMCA was 1.82 mg. HCl/g. of sample with a range of 1.62 to 1.94 mg. HCl/g. For comparative purposes, the maximum allowable heat stability value as given in A.S.T.M. Specifications D 708-44T for vinyl chloride-acetate resin plastic sheets is 2 mg. HCl per gram. All 3 sheets gave similar data, but sheet A was about 15% lower than the other 2 sheets, which differed by only 2.5 percent.—END

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Cost-saving Solution to Hundreds of Product Problems!

Manufacturers across the nation are finding U. S. Royalite the answer to *profitable*, small-quantity production in the face of ever-rising production costs.

This amazingly durable, but lightweight plastic can be perfectly formed on *low-cost* equipment with conventional techniques. It is available in sheets color-permeated throughout and prefinished to your specifications. You eliminate post graining, finishing and painting costs.

Standard or flame-resistant U. S. Royalite can be sawed, sheared, sanded, punched, nailed, bolted, riveted, sewed and cemented. It is available soft as leather or hard as steel.

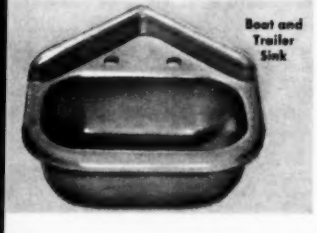
In mass production operations, tough U. S. Royalite cuts damage losses . . . stands up against rough assembly line handling.

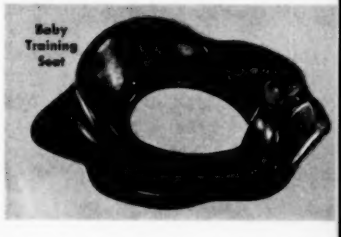
Analyze your products against the many advantages of U. S. Royalite check-listed below. Let the engineering staff of United States Rubber Company show you how you may improve your products and cut production costs with adaptable U. S. Royalite. Write Dept. MPR-2.

CHECK LIST of U. S. Royalite advantages:

- ✓ Standard or Flame-resistant
- ✓ Lightweight
- ✓ Tough
- ✓ Non-splintering
- ✓ Non-warping, non-corrosive
- ✓ Impervious to oils, most acids, alkalies
- ✓ Highly resistant to impact
- ✓ Waterproof, stainproof
- ✓ Easily formed on low-cost tools
- ✓ Prefinished to your specifications
- ✓ Color-permeated throughout
- ✓ Available in sheets
- ✓ Stable under changing atmospheric conditions
- ✓ Exceptional electrical insulating qualities
- ✓ Low rate of heat conductivity

U.S. ROYALITE





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PERFORATING OF PLASTICS. Folder contains sample swatches of films, rigid sheets, and coated plastics perforated with various sizes and spacings of holes, for ventilation, air escape, light transmission, and decorative applications. The Harrington & King Perforating Co. **(F-201)**

SILICONES. Brochure explains what Silicones are in terms of their use in polishes, water repellents, release agents, lubricants, defoamers, protective coatings, and electrical insulation. Dow Corning Corp. **(F-202)**

EXTRUSION SCREW MANUFACTURE. Booklet explains in detail the 19 steps involved in the manufacture of precision feed screws for NRM extruders. National Rubber Machinery Co. **(F-203)**

ELECTRO-FORMED SPRAY PAINTING MASKS. Folder illustrates the three basic types of spray painting masks, explains how they are used and manufactured, and lists the requirements for mask making. Conforming Matrix Corp. **(F-204)**

ELECTRONIC TESTING RECORDER. Group of specification sheets on the Olsen Model 51 electronic recorder and testing equipment for use with it, for measuring stretch, strain flexure, and other deformation in plastic samples. Tinius Olsen Testing Machine Co. **(F-205)**

PLASTIC PACKAGING. Folder contains a series of ad reprints showing assorted snap-sealed, textured plastic pouches, kits, and packets for use in packaging a wide range of products. Electrical Industries, Inc. **(F-206)**

ETHOXYLINE RESINS. Folder on "Araldite" ethoxyline resins covers their outstanding properties and suggests a wide range of applications in bonding, casting, and coating. Ciba Co., Inc. **(F-207)**

PROPERTIES AND USES FOR MOLDED PLASTIC MATERIALS. Handy, circular plastic chart gives ready reference as to the water absorption, dielectric constant, chemical and heat resistance, specific gravity, tensile strength, color range, bulk factor, mold shrinkage, flexural and impact strength, and suggested applications of 16 familiar plastics. Shaw Insulator Co. **(F-208)**

CONTINUOUS EXTRUSION TAKE-UP EQUIPMENT. Brochure illustrates and explains the advantages of IOI tensioning and capstan units for take-up of wire, cable, monofilaments, tubing, and other flexible extrusions. Industrial Ovens, Inc. **(F-209)**

MOLDING AND EXTRUSION. Elementary descriptions of the processes, plus four-color illustrations of numerous products. Company services are described. Technical data includes material selection, tables, charts. Elmer E. Mills Corp. **(F-210)**

AUTOMATIC ROLL SHEET CUTTER. Booklet describes the Beck automatic roll sheet cutters for high speed preparation of truly square sheets of rigid and flexible plastic from roll material. Charles Beck Machine Corp. **(F-211)**

ELECTRIC POWER DRIVES. Catalog contains complete descriptive information on the variable speed drives, geared motors, and constant normal speed motors in drip-proof, splash-proof, totally enclosed, and pipe ventilated designs manufactured by Sterling Electric Motors, Inc. **(F-212)**

IMPACT PHENOLIC AND MELAMINE MOLDING COMPOUNDS. Brochure contains complete technical data and specifications of Fiberite impact molding compounds which are available in conventional bulk form or as custom made preforms. The Fiberite Corp. **(F-213)**

PLASTICS INJECTION PRESS. Specification sheet and description of a fast-cycling 2-oz. capacity injection press. The Van Dorn Iron Works. Co. **(F-214)**

COATED PLASTIC SHEETS. Folder contains samples of printed, coated, metallized, embossed, and adhesive-backed sheet cellulose acetate and polystyrene. Coating Products. **(F-215)**

PLASTIC WINDERS. Folder contains photos showing the sequence of continuous surface winding on Dilts plastic winders. Also shows continuous central winding. Dilts Machine Works, Div. The Black-Clawson Co. **(F-216)**

PHENOLIC RESIN CORE BINDERS. Bulletin covers in detail the conditions to be met for the successful use of "Resinox" phenolic resin core binders and the techniques involved in their application. Monsanto Chemical Co. **(F-217)**

SUMP-TYPE LIQUID FILTERS. Folder contains operational and ordering data on Marvel Synclinal Filters for keeping hydraulic oil clean. Marvel Engineering Co. **(F-218)**

VERTICAL INJECTION MOLDER. Bulletin and specification sheet contains details about the Watson-Stillman 6-oz. vertical injection molding machine which is of particular advantage where inserts are used. Watson-Stillman Co. **(F-219)**

GOLD LEAF STAMPING MACHINES. Folder explains the various models of "Kwik-print" leaf stamping machines for plastics and the various accessories which are available for use with them. Cane Brothers & Lane, Inc. **(F-220)**

"KEL-F." Technical bulletin gives a quick run-down of the important physical, chemical, and mechanical properties of "Kel-F" thermoplastic material. M. W. Kellogg Co. **(F-221)**

SPECIAL NAILS, RIVETS, SCREWS. Booklet explains the cold heading technique and how it is used to manufacture an endless variety of special nails, rivets, screws, hinge pins, and other fastening and assembly devices for use in plastic materials. John Hassall, Inc. **(F-222)**

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HIGH SPEED MIXING. Folder contains four-color illustrations showing how the "Entoleter" centrifugal mixer makes homogeneous mixtures of styrene powders, pigments, etc. The Safety Car Heating and Lighting Co., Inc. **(F-223)**

TOOL STEEL SELECTOR. Circular chart which quickly tells exactly what type of tool steel should be used for about 95% of the machine-tool operations found in jobbing and specialty machine shops. Instructions for use included. Crucible Steel Co. of America. **(F-224)**

"KRALASTIC" MOLDING AND EXTRUSION COMPOUNDS. Bulletin details the composition, features, uses, properties and method of handling "Kralastic" compounds for injection and compression molding and extrusion. Naugatuck Chemical, Div. of United States Rubber Co. **(F-225)**

"WITCOMBINGS." The latest issue of this house organ contains articles on the use of color in industry, the origins of the plastic industry, the newest products from the Witco Laboratories, and significant news items. Witco Chemical Co. **(F-226)**

COLORING OF POLYETHYLENE. Leaflet contains a discussion of the methods and pigments used to color polyethylene materials during molding or extrusion. Ferro Corp. **(F-227)**

COMPRESSION MOLDING EQUIPMENT. Folder shows the range of preforming machines, compression presses, platen presses, heating platens, and hobbing presses manufactured by T. H. & J. Daniels Ltd. **(F-228)**

PLASTIC SCRAP GRINDER. Folder on the profitable grinding of plastic sprues, gates, warm-up shots, and rejects into homogeneous granules for uniform mold flow using the American Rotary Knife Chopper. American Pulverizer Co. **(F-229)**

MOLDMAKING CATALOG. New 1952 catalog features a complete line of standard mold bases and component parts along with tools and mold polishing supplies. Contains platen data and specifications on most popular plastic molding presses. Detroit Mold Engineering Co. **(F-230)**

"ROGERS AND ITS FIBERLOYS." Pamphlet basically about various plastic laminated impregnated materials, but containing many philosophical and sometimes humorous asides on management, labor, advertising, etc. Roger Corp. **(F-231)**

INJECTION MOLDING MACHINE. Specification sheet on a thermoplastic injection molding machine of 3-oz. capacity. R. H. Windsor, Ltd. **(F-232)**

REINFORCED PLASTICS. Brochure illustrates the equipment and facilities available for making large reinforced and laminated parts which are molded by Zenith Plastics Co. **(F-233)**

DRILL PRESS FEED. Bulletin illustrates and describes the Bellows drill press feed for increasing speed of production by providing automatic or semi-automatic feeding of drill press spindles. The Bellows Co. **(F-234)**

TRIPLE ALLOY STEEL. Booklet gives the uses of a new alloy steel designed for the needs of hard-tempered, tough-tempered, and mild-tempered machinery maintenance parts. The Carpenter Steel Co. **(F-235)**

VACUUM FORMING MACHINES. Bulletin contains the specifications and explains the operation of a manual and a semi-automatic machine for vacuum forming of thermoplastic film and sheet materials. Sill Industries. **(F-236)**

"VINYLITE" RESINS AND PLASTICS. Forms, properties, and applications of vinyls, presented in non-technical language. Covers both rigid and non-rigid vinyls with suggestions on use in various manufacturing processes. Property data tables. Bakelite Co. Div. of Union Carbide and Carbon Corp. **(F-237)**

"SPIRAL FLOW" MIXERS. Specifications, features, and details of several sizes of intensive mixers of unique design which allow cooling or heating of the product being mixed. Stewart Bolling Co., Inc. **(F-238)**

NAILING MACHINE. Bulletin tells about high speed precision machine which is adapted for driving small nails and setting of pins and rivets in plastic at high speed. Hastings Sales Engineering Co. **(F-239)**

ORGANIC STABILIZER. Data sheet on Stabilizer OM-10 which has low volatility and odor at high temperature processing, and for use where lower amounts of plasticizer are used. Advance Solvents and Chemical Corp. **(F-240)**

HYDRAULIC PRODUCTION EQUIPMENT. Folder describes a number of diverse hydraulic power vises, presses and pumps, and air cylinders and air presses, with applications within the plastics industry. Studebaker Machine Co. **(F-241)**

MOLDING GLASS FIBER REINFORCED ALKYDS. Bulletin contains latest available information on transfer and compression molding techniques for use with Plaskon 440 glass-fiber reinforced alkyd molding compound. Plaskon Div., Libbey-Owens-Ford Glass Co. **(F-242)**

MERCHANDISING WITH CORRUGATED BOXES. Booklet explains the points to be considered in planning a merchandising package and tells how various items can be sold successfully in printed, ingeniously constructed corrugated boxes. Hinde & Dauch Paper Co. **(F-243)**

RIGID PLASTIC SHEETS. Sample booklet illustrates the various colors of "Vinylite" rigid plastic sheets, press polished on both sides, which are available for immediate delivery from the Plastic Binding Corp. **(F-244)**

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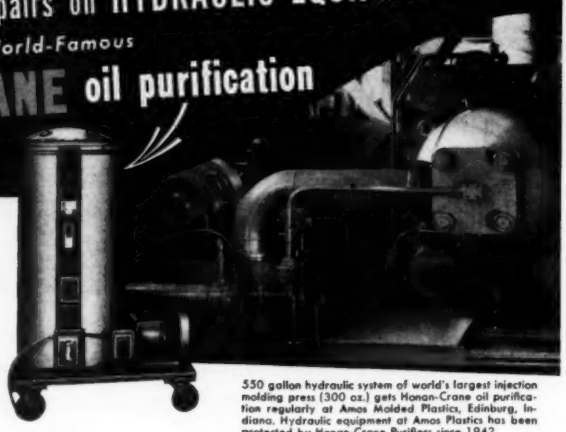

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World's Largest Producer of Fiber Glass Reinforced Plastics
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Furfural

(*Continued from pp. 122-4*)

These resins are made by reacting phenol with bagasse under conditions which liberate some furfural from the bagasse for combination with the phenolic body. Additional furfural is added in the presence of alkaline catalysts, in varying amounts depending upon whether a thermosetting or thermoplastic resin is desired.

In the manufacture of brake linings and clutches it is common practice to incorporate certain additives known as friction modifiers along with the principal ingredients, asbestos and resinous binders. The modifiers assist in maintaining even frictional characteristics of the surface area at various operating temperatures. Organic friction modifiers usually consist of powdered resins which soften to a rubbery state at definite temperature ranges. U.S. patent 2,383,790 discusses the preparation of friction fortifying dusts from acid-catalyzed furfural. Furfural resinifies with heat to a gelatinous stage and then cures to a solid. The cured material while infusible still softens slightly to a rubbery state at 500 to 600° F., and is therefore useful as a friction modifier. When frictional characteristics are desired at lower temperatures, additives such as vegetable oils, fatty acids, rubber, and pitches are incorporated with the acid-catalyzed furfural before resinification.

Carbon and graphite articles are ordinarily porous and permeable to many fluids. In order to utilize the chemical inertness inherent in the element carbon, synthetic resins are cured in the pores of the material in order to render it impervious. The resulting stock may then be fabricated into tanks, pipe, valves, heat exchangers, and similar equipment for the chemical processing industry. Acid-catalyzed furfural resin was the first synthetic resin employed to render such stock[3] impermeable. Suitably catalyzed furfural is readily forced into the pores of the carbon stock due to its low viscosity and wetting ability. The impregnated article is then subjected to curing temperatures to resinify the resin in situ under ele-

[3] Karbate, National Carbon Company trade-mark U.S.P. 2,174,887 and Trans. Amer. Inst. Chem. Eng. *42*, 121 (1946).

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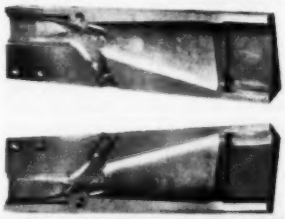
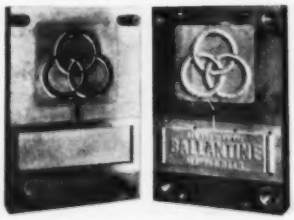
PLASTIC GUN STOCK MOLD . . .

An unusual combination of facilities and techniques was required to engrave the hob, hob the knurled hand grip section, and Keller machine the mold cavity. Here, accuracy and craftsmanship paid off in performance.



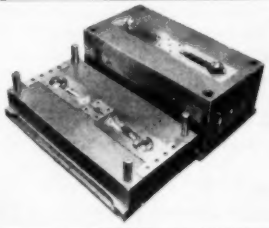


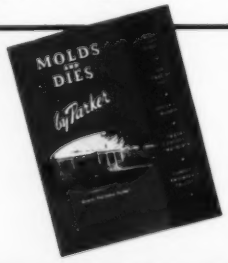
PLASTIC ADVERTISING DISPLAY MOLD . . .

Unique engineering problems were encountered successfully in building this display mold. Note: Raised knurled rings with raised engraving on force. Here, several specialized operations of mold making were combined to produce a *better* mold.

PLASTIC MOLD FOR HAND MICROPHONE

A number of precision molded plastic parts were required to fit perfectly into a microphone assembly. Internal electronic controls with exacting tolerances were housed in this assembly. Here, engineering experience and versatility paid off in performance again.





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vated pressure. The impregnation and subsequent filling of the pores of the carbon or graphite article substantially increases its strength over that of the base material. The chemical inertness of the cured resin and the high resistance to corrosion of the carbon permit the successful handling of highly corrosive gases and liquids.

Furfural-ketone reaction products further reacted with formaldehyde are interesting thermosetting resins. U.S. patent 2,363,829 recites that such resins in general involve the reaction of 1 mole of furfural with 0.5 to 1 mole of a ketone in an alkaline medium; the product is then reacted in the presence of acidic catalysts with 0.5 to 2 moles of formaldehyde. These products are used primarily as resins compatible with synthetic rubber to increase the resistance of rubber to oils and chemicals. When furfural-ketone resins are used along with vinyl resins and milled with GR-A synthetic rubbers, very soft stocks result. This characteristic together with the property of petroleum insolubility of such resins makes them useful in the printing roll field (U.S.P. 2,545,461). U.S. patent 2,461,510, example 8, makes use of furfural and mesityl oxide to achieve film-drying properties due to the presence of the unsaturated chain. U.S. patent 2,461,508 shows that by varying the length of the ketone linkage useful frictional binders may be obtained.

A resinous reaction product of furfural and methyl acetone has been used for many years in a commercial lacquer.[4] The resinous reaction product forms the bulk of the solids content of the lacquer, and furfural is also used as a solvent for the resin formed. The lacquer serves as a final resistant coating on lithographic plates to produce wear resistant coatings on the work areas. The coatings when exposed to arc light are insoluble in gasoline, turpentine, and ink oils, and are consequently never removed when the plate is washed.

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[4] No-Wok, Wadsworth Watchcase Co.

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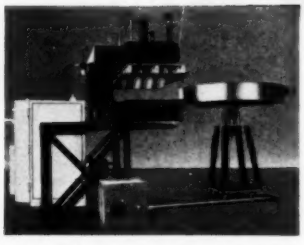

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tablished that hydrophilic aggregates used in road building can be changed to the desired hydrophobic character by treatment with furfural or a furfural-aniline resin. The unfavorable economics of the treatment have so far prevented wide commercial acceptance in road building, but furfural-aniline is again receiving attention in field studies for road and airport construction. It has been reported[5] that the resin formed by the interaction of 2 parts aniline and 1 part furfural is a good bonding agent for soil and an effective water-proofing material. As furfural and aniline react immediately on contact, it is necessary to add the chemicals separately to a relatively dry soil. Added catalysts are suggested to effect reaction in the presence of moist soil.

Furfural-Phenol Reaction Products

The products obtained by reacting less than 1 mole of furfural with 1 mole of phenol with an alkaline catalyst are not permanently fusible. Unless some care is exercised relative to time and temperature during the dehydration or steam-stripping step, the resin will advance to a gel state due to excessive cross linkage. However, the conditions for avoiding excessive cross linkage during dehydration are well developed by the phenolic resin manufacturers so as to produce brittle and grindable furfural-phenol resins for adjusting phenolics to optimum flow-cure properties.

A formulation for producing a laboratory sized sample of a grindable furfural-phenol resin will be cited, but the reader should not assume that commercial practice in the phenolic resin industry is divulged.

Dissolve 8 g. potassium carbonate (the catalyst) in 400 g. phenol by heating to 135° C. Add 347 g. furfural dropwise over a 30 min. period to the reaction flask which is fitted with a steam-heated reflux condenser followed by a water-cooled condenser to remove the water of reaction. Maintain the temperature of the reaction system at 135° C. for 3½ hr. after the furfural is added. Vacuum distill (about 20 mm.) at temperatures up to 135° C. until the desired melting point resin is attained

[5] Technical Development Report No. 136, Civil Aeronautics Administration, Indianapolis, Feb. 1951.

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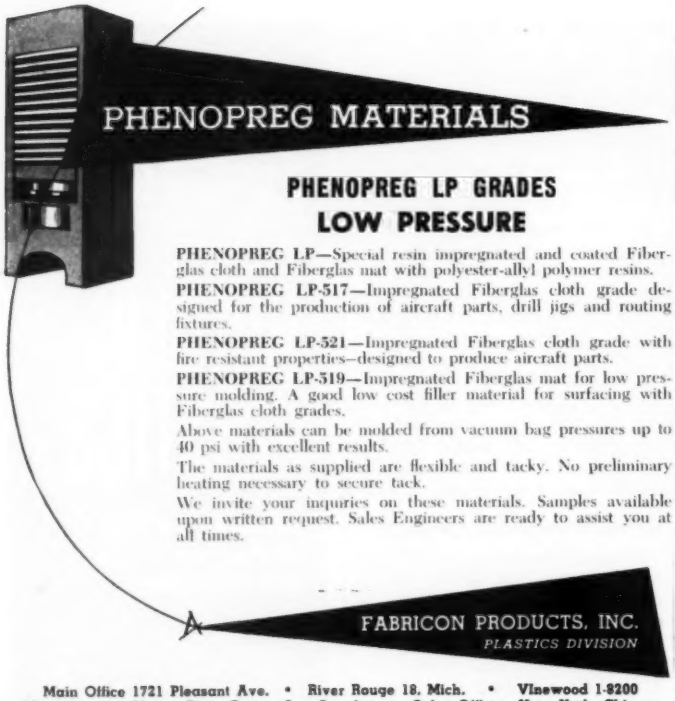
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(about 40 min. to achieve a melting point of 112° C.). Pour into a cooling pan, break into lumps, and grind to a powder.

The resins formed in the reaction of phenol and furfural are probably more complex and less understood than their formaldehyde analogs. It is difficult to produce useful resins from phenol and furfural by using the methods employed with phenol and formaldehyde. The most commonly used phenol-formaldehyde resins are the two-stage type or novolaks, i.e., soluble, fusible resins which become thermosetting when compounded with hexamethylenetetramine. They are formed by reacting formaldehyde with a slight molar excess of phenol in the presence of an acid catalyst. When furfural and phenol are reacted in the presence of an acid catalyst, useless gels are obtained unless very large excesses of phenol are employed to inhibit the production of furfural-acid decomposition products.

However, alkaline-catalyzed furfural-phenol novolaks can be produced which are equally as fusible and soluble as acid-catalyzed formaldehyde-phenol novolaks. This is accomplished by employing modest excesses of phenol (3:1) in the system and removing the unreacted phenol during dehydration.

The other large class of phenol-formaldehyde resins in commercial use are the one-stage type. No hexa addition is required to cure this type. They are formed by reacting phenol with a molar excess of formaldehyde in the presence of an alkaline catalyst. When the same molar ratio of phenol and furfural are reacted under these conditions, the products are highly cross-linked before all of the phenol is utilized in the reaction product. At any rate, no commercially available one-stage phenol-furfural resin is known today. Nevertheless, the most popular catalysts for making two-stage resins with furfural and phenol are alkaline materials, such as alkaline earth hydroxides and alkali carbonates. Ammonium hydroxide is not considered as a satisfactory catalyst; its rapid reaction with furfural to irreversibly form a thermoplastic brittle resin removes the ammonium hydroxide from the system and essentially terminates the reaction of the remaining furfural with the phenol.—END

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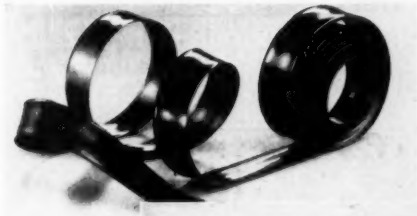

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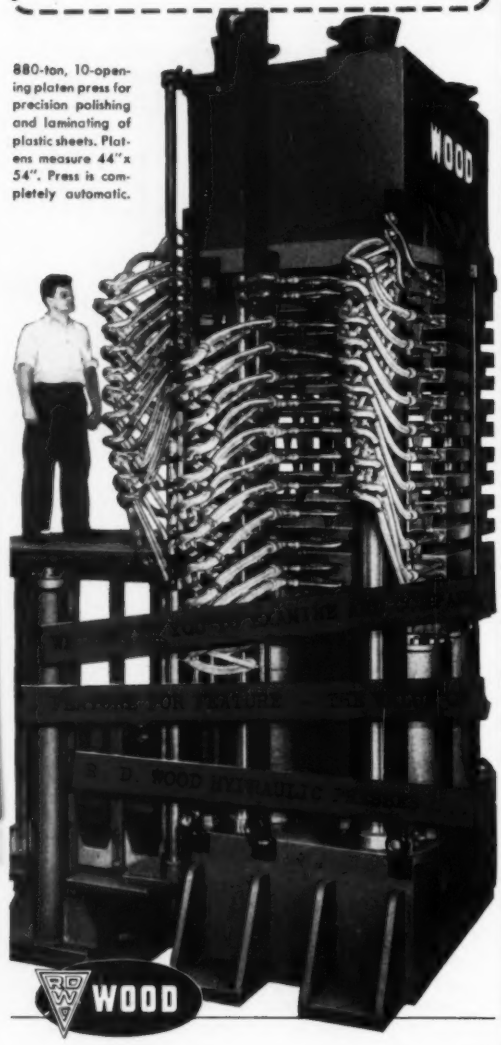

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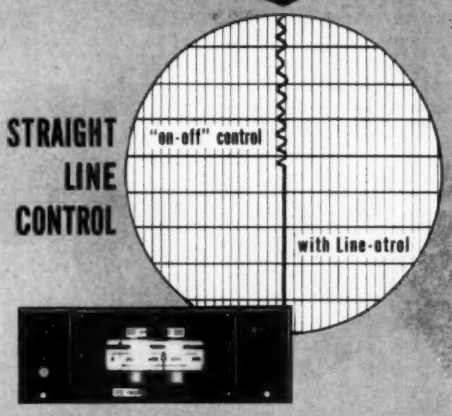

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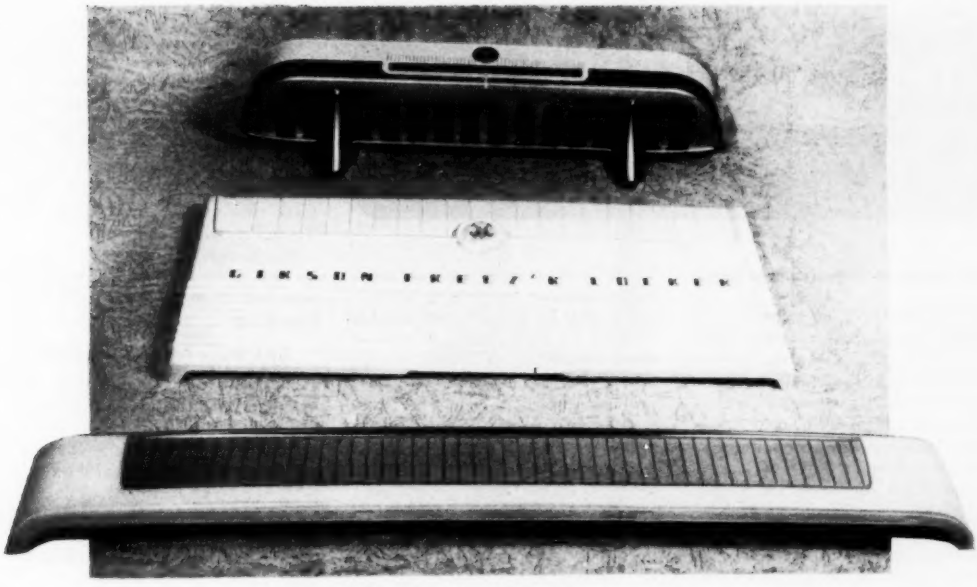

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NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Film Producers Organize New Group

ENLARGEMENT of scope for the Plastics Coatings and Film Association seemed assured after their recent meeting at the Waldorf-Astoria in New York City where a Film Section to be affiliated with PCFA was formed and a steering committee appointed to formulate plans of action.

The PCFA was organized in 1927 and has been continually in existence since that time. In those days, the members were primarily pyroxylin coated fabric producers. Since the technique of operation was an art rather than a science, keen competition in know-how and extreme secrecy prevailed. Marketing problems of intense gravity joined the struggle for technical superiority.

When World War II and the need for vinyl coated fabric became apparent, the pyroxylin coaters all turned to vinyl for both spread and calender coated jobs. Many of them became calenderers of unsupported sheet as well, and since the calendering equipment and technique needed for sheet is similar to that for film, several have gone into the film business. Their pyroxylin business has dwindled to not much over 10% of total volume. Sales volume of those individual companies in this industry who publish annual statements generally runs anywhere from $2 to 12 million a year, depending upon the amount of equipment employed.

After a survey of the situation, our interpretation is that members of the Association have learned to live with their problems by establishing industry aids common to any well run trade association—they can't make their industry prosperous in times of depression and they can *not* monkey with prices—they'll scrap with their competitors like Kilkenny cats to get any given customer's order, but they have managed to make customers feel that they are getting what they pay for—in other words, the customer knows that he is getting good, better, best, or fair quality according to what he pays. A great number of them are by no means convinced that adoption of Commercial Standards would give much relief to their primary problems.

The activities of PCFA are briefly accounted for by listing the names of their committees, which are: industrial relations; public relations; simplification; statistical; technical; textile; traffic. The Executive Committee believes that it can be of service to film producers because of its community of interest; its long experience in handling trade problems similar to those now troubling the vinyl film industry; and because those interests will be served by a compact group at management level whose sole interest is production and sales of film, sheet, and coated fabric.

The film section will be operated separately as a section of PCFA. Companies who already belonged to the sheet section that joined the film section at this first meeting are Firestone; B. F. Goodrich; U. S. Rubber; Pantasote. New members who immediately signed up were Fremont Rubber; General Tire; Goodyear Rubber Sundries; Goodyear Tire & Rubber; Plastic Film Corp. It is doubtful that the total production of these companies represents half of the film produced, but several more companies are expected to join, and even if no new members were added, Association members believe that it represents a good wholesome slice of the industry—enough to indicate trends in matters of statistics and influence industry practice in matters of standards.

Chairman of the Steering Committee is C. D. DeLong of B. F. Goodrich. Other members are J. P. Frank of Presto; Elmer French of Firestone; R. P. Johnson of Fremont; C. A. Wyman of Pantasote.

Members of the Simplification and Standards Committee which will work with specifications for government and civilian buyers, nomenclature, improvement of product quality and other like problems are: R. P. Johnson of Fremont, chairman; George H. Callum, U. S. Rubber; E. E. Ellies, Goodyear; J. P. Frank, Presto; J. E. Powers and P. C. Mathewson of General Tire. The same personnel also makes up the Trade Practices Committee.

The Statistical Committee is made up of R. S. Price of Goodrich, chairman, and Alfred C. Bruce of Plastic Film Corp.

S.P.I. Plugs for Film Standards

COMMERCIAL Standards and Trade Practice Rules for the vinyl film industry were given a public reading and opened for discussion at a meeting of the Society of the Plastics Industry's Vinyl Plastic Film Division at a recent meeting in the Hotel Astor, New York City.

A special S.P.I. committee has been working on these standards for vinyl film since March, 1946. Although by no means complete, they have reached a state where they are now on the verge of being submitted to the Bureau of Standards of the U. S. Dept. of Commerce, and through that organization submitted to the industry for approval or rejection. If adopted, they become a measurement of quality for vinyl film.

The work of the Trade Practice Rules Committee was outlined by Alvin V. Roberts of Ross & Roberts, who stated that a draft patterned after the textile industry's Worth Street Rules had been drawn up and would be sent to all members of the industry. They will be submitted to the Federal Trade Commission, and if approved, established as the code of business procedure for the trade.

The proposed rules would concern such trade practices as passing of title; storage; terms of collection and credit; and other industry-wide problems, but the big idea is that controversies would be settled under the rules of the American Arbitration Association.

S.P.I. spokesmen point out that they hope to be able to do as good a job for film producers as they have for other sections of the industry, and list their activities in obtaining a favorable hearing before government agencies in preventing prejudice against plastics in fire prevention regulations; in promulgation of Commercial Standards for wall tile

* Reg. U.S. Pat. Office

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The new steam center of the Medical Center Steam Company, serving the University of Illinois and others in the Medical Center Area in Chicago provides a single, economical and reliable source of steam for all buildings in the group.

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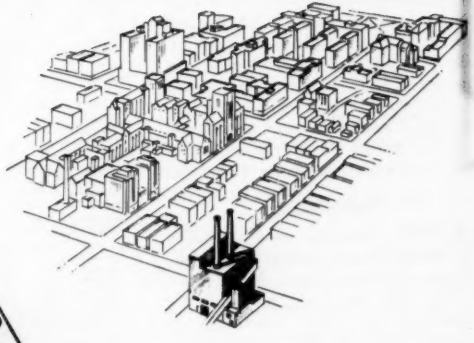
The steam plant and distribution system were designed and constructed by Stone & Webster Engineering Corporation.



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and dishware; activities in behalf of plastic pipe installations; and other similar chores that require industry-wide cooperation.

Another interesting facet of the meeting was a discussion of whether or not the Film Division of S.P.I. should contain memberships extending from material producers to end users, or should be broken up into separate segments consisting of film producers, finishers, and fabricators. That question was a "toughy." So far, no one has yet decided whether the group's problems can best be solved by amalgamated or divided action. That is one of the first decisions to be made by a newly appointed administrative committee which will coordinate the technical activities of the S.P.I. Film Division with the expanding marketing functions, such as the vinyl film standards and the trade practice rules. Members are F. A. Abbiati, Monsanto; C. L. DeLong, Goodrich; J. P. Frank, Presto; Elmer French, Firestone; George C. Miller, Bakelite; Fred S. Strauss, Harte & Co.

Fabricating Company Formed

ORGANIZATION of Sturdi Fabri-Box Co., Ashtabula, Ohio, has been announced by J. R. Newlon. The newly formed company will fabricate boxes, trays, and similar items from fibrous glass reinforced plastic sheets, angles, and molded sections. Bulk of production will be boxes reinforced with metal at the corners and edges, which have found wide acceptance as bakery and food containers and as luggage.

Mr. Newlon was formerly associated with Molded Resin Fiber Co.

Static Modifier

A NEW chemical product called Plastic Bath, developed by Moldkraft Products, Inc., Van Nuys, Calif., will reputedly minimize the problems of static electricity in plastics products. The dipping of any plastic material into a solution of Plastic Bath will clean, polish, and dust-proof the plastic without rubbing or hand drying, according to the producer. It is available in concentrated form. One 6-oz. bottle, when added to water, will make 30 gal. of Plastic Bath.

Moldkraft Products manufactures plastic display fixtures and developed this product to eliminate the problems of static electricity.

Expansion via Certificate of Necessity

A PARTIAL list of Certificates of Necessity granted to various companies since January 1952 in whom the plastics industry is particularly interested in one way or another is presented here. We believe it is the first time this information has been assembled in one spot. The list is admittedly not complete; many certificates were granted before January 1952 and over 120 that pertain directly to the plastics program are still in the hands of Government officials awaiting action.

Benzene from petroleum is not included here since that program was announced by the Petroleum Administration and printed in MODERN PLASTICS some months ago. Many of the proposed styrene monomer and phenol plants have also been previously announced.

Furthermore, many companies who will make extended use of plastics in electronics, aircraft parts, ordnance, and miscellaneous applications have obtained Certificates but can't be identified from published lists since they are named only as producers of the finished items.

Most of the grants are for raw materials. Whether or not many more Certificates will be issued for processing equipment such as calenders, presses, other equipment or plant space, is a question of doubt

Certificates of Necessity

Company	*Product*	*Amount Applied for*	*Amount Certified*	*% Allowed*
Koppers Co., Inc.				
Kearny, N.J.	Benzene	$ 165,200	$ 165,200	90
Jefferson City, Ala.	Naphthalene	2,145,000	2,018,000	60
Kobuta, Pa.	Phthalic Anhydride	4,000,000	4,000,000	50
Kobuta, Pa.	Benzene and its homologues	181,027	181,027	90
Chicago, Ill.	Naphthalene	196,000	196,000	60
Follansbie, W. Va.	Crude naphthalene	267,000	267,000	60
Fontana, Calif.	Naphthalene	2,425,800	2,425,800	60
General Electric Co.				
Waterford, N.Y.	Silicone products for the military	4,506,000	4,506,000	60
Union Carbide & Carbon Corp.				
Kanawha County, W. Va.	Ethylene oxide	33,844,008	7,507,597	45
Texas City, Tex.	Polyethylene	17,694,200	16,604,200	60
So. Charleston, W. Va.	Anhydrous ethylene chloride	102,300	102,300	75
Dow Corning Corp.				
Midland, Mich.	Silicone products for the military	10,997,000	10,194,000	60
The Special Chemical Co.				
Cleveland, Ohio	Polyvinyl acetate	100,000	100,000	45
Monsanto Chemical Co.				
Monsanto, Ill.	Phenol	5,575,000	5,403,478	50
St. Louis, Mo.	Phthalic anhydride	5,005,000	4,880,000	50
Springfield, Mass.	Polyvinyl chloride film	2,685,000	2,685,000	50
Anniston, Ala.	Tolylene diisocyanate	211,000	211,000	70
Springfield, Mass.	Polyvinyl chloride resin	1,190,000	1,190,000	50
Texas City, Tex.	Vinyl chloride	7,430,000	7,430,000	50
Sherwin-Williams Co.				
Chicago, Ill.	Refined phthalic anhydride	1,287,200	1,287,200	50
E. I. du Pont de Nemours & Co., Inc.				
Orange, Texas	Polyethylene	10,293,000	10,293,000	60
Orange, Texas	Polyethylene	6,195,000	6,195,000	60
Parkersburg, W. Va.	Fluoroethylene	503,900	503,900	60
Swedlow Plastics				
Youngstown, Ohio	Aircraft parts	265,500	150,000	50
Youngstown, Ohio	Aircraft parts	15,428	13,609	60
Youngstown, Ohio	Laminated plastics for aircraft	55,799	31,256	60
Los Angeles, Calif.	Acrylic products	13,643	8,988	60
Honolulu Gas Co.				
Honolulu, Hawaii	Benzene	243,427	243,427	90
The Dow Chemical Co.				
Freeport, Tex.	Benzene	1,110,000	1,110,000	90
Midland, Mich.	Styrene	182,280	182,280	60
Freeport, Tex.	Chemicals	5,000,000	4,984,500	45
Midland, Mich.	Chemicals	998,200	998,200	45
Midland, Mich.	Plasticizers	2,675,000	2,675,000	55
Salt Lake Refining Co.				
Salt Lake City, Utah	Cumene for phenol	1,760,000	1,358,000	50
Commercial Solvents Corp.				
Agneco, Calif.	Pentaerythritol and formaldehyde	436,000	436,000	65
The Neville Co.				
Anaheim, Calif.	Petroleum polymer resins	208,969	73,450	45
Standard Oil Co. of California				
San Francisco, Cal.	Phenol	5,340,000	———	—
Modglin Co., Inc.				
Los Angeles, Cal	Aircraft parts	611,045	589,961	65

(*Continued on following page*)

VISIBILITY by Swedlow

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Tremendous speed and terrific hitting power make the Republic Aviation Corporation's F-84F Thunderjet a formidable addition to the U.S. Air Force's new jet fighting team. The optical properties of its Swedlow-made transparent enclosures contribute to the efficiency with which this versatile fighting machine can perform in action. With duplicated facilities in California and Ohio, Swedlow brings to the production of today's speedier aircraft, where precision more than ever counts, ten years of specialized experience in the precision engineering and production of astrodomes, canopies and other acrylic parts.

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Certificates of Necessity (Continued)

Company	Product	Amount Applied for	Amount Certified	% Allowed
Hercules Powder Co.				
Paulsboro, N.J.	Phenol	8,500,000	8,300,000	50
Mansfield, Mass.	Formaldehyde	2,409,904	2,379,904	55
Brunswick, Ga.	Para cyamene	407,090	407,090	50
Vulcanized Rubber & Plastics Co.				
Morrisville, Pa.	Ordnance	144,800	68,000	50
Continental Diamond Fibre Co.				
Bridgeport, Pa.	Vulcanized fiber sheets for military	1,050,000	1,050,000	50
Newark, Del.	Aircraft parts	30,735	30,735	50
Bridgeport, Pa.	Fabricated items for Navy	35,825	35,825	50
Sloss-Sheffield Steel & Iron Co.	Benzene	73,170	73,170	90
Reichhold Chemicals, Inc.				
Detroit, Mich.	Phenol	1,479,500	1,375,000	50
Bjorksten Research Laboratories, Inc.				
Madison, Wis.	Research building	113,000	80,000	65
Zenith Plastics Co.				
Gardena, Calif.	Aircraft parts	26,921	26,702	65
Hevden Chemical Co.				
Garfield, N.J.	Resorcinol	397,710	397,710	65
Fords, N.J.	Formaldehyde	280,000	280,000	50
Fords, N.J.	Hexamine	426,500	182,150	40
Reilly Tar & Chemical Corp.				
Cleveland, Ohio	Naphthalene	903,415	903,415	60
Granite City, Ill.	Crude naphthalene	110,880	110,880	60
Esso Standard Oil Co.				
Baton Rouge, La.	Octyl alcohol	477,000	326,000	70
Baton Rouge, La.	Iso octyl and tridecyl alcohol	3,000,000	2,760,000	70
H. Koch & Sons				
San Rafael, Cal.	Fiberglas cases for military	13,202	13,202	75
M. W. Kellogg Co.				
Jersey City, N.J.	Thermoplastic material	131,452	131,452	60
Taylor Fibre Co.				
La Verne, Cal.	Aircraft parts	42,200	11,232	50
Sierra Engineering Co.				
Monrovia, Cal.	Prosthetics	120,171	80,030	30
Aero Service Corp.				
Philadelphia, Pa.	Relief maps for Air Force	6,931	6,931	66
Allied Chemical & Dye Corp.				
Detroit, Mich.	Naphthalene	1,012,000	1,012,000	60
The Barrett Div.				
Chicago, Ill.	Phthalic anhydride	4,110,100	4,110,000	50
Lincoln Plastics Corp.				
Cambridge, Ohio	Components for military items	110,566	110,566	50
Old Dutch Refining Co.				
Muskegon, Mich.	Benzene toluene	326,100	326,100	40
Kurz-Kasch, Inc.				
Dayton, Ohio	Ordnance	5,377	4,497	65
Shell Chemical Co.				
Houston, Tex.	Ethyl chloride	9,500,000	6,232,000	65
American Insulator Corp.				
New Freedom, Pa.	Aircraft parts	24,004	24,004	50
U.S. Steel Co.				
Clairton, Pa.	Naphthalene	1,200,000	1,200,000	60
Gary, Ind.	Naphthalene	3,817,000	3,817,000	60
Tennessee Coal, Iron & Railroad Co.				
Birmingham, Ala.	Naphthalene	1,150,000	1,150,000	50

at this writing. Many people believe that the industry already has enough equipment to process all the raw material that is likely to become available over the next two or three years. They are also hopeful that the military will not repeat their actions of 1942-45 when they awarded contracts to firms without plastics processing equipment and then obtained priorities for them to authorize installation of equipment in other than plastics producing plants. Of course, there might be exceptional need in some cases where new developments or a possible expansion in such things as reinforced polyester-glass for military purposes are involved, but exceptionally close scrutiny will be given any application for a Certificate of Necessity which implies that additional equipment is needed to handle any of today's most commonly used plastics.

Of course, there is nothing to prevent a man from building or enlarging his plant and equipment without a Tax Certificate if he can obtain structural material and equipment. That problem might not be difficult today, but if war comes, he would probably be stymied. The Certificate enables him to write off his taxes for the new plant within a five-year limit instead of the usual 20- to 25-year period, and also acts as a type of priority since the Government (theoretically at least) allows Certificates only for those materials which are deemed to be necessary in war time.

The percentage of the amount allowed, as shown in the last column, is granted on the basis of war-time necessity—that is, expansion at this time is based on the belief that 50 or 60, or whatever percent allowed, is necessary for defense.

Accelerated amortization has now been approved for 8738 new or expanded facilities by DPA since the emergency was declared. Total amount of proposed investment is $17,600,000,000. DPA has declared $16,700,000,000 eligible for certification, of which $10,700,000,000, or approximately 64%, was certified for rapid tax write-off. Value of the industrial organic chemicals plants and equipment to receive Certificates up to December 31, 1951, was $250,000,000, of which $171,000,000 worth, or 68%, was in place by March 31, 1952.

Diallyl Phthalate

MOST of the diallyl phthalate polymer now produced in this country has been channeled into molding powder, according to Shell Chemical Co., the sole producer in this country. Molding powder containing DAP is being produced by Acme Resin Co. of Chicago; Plaskon Div. of Libbey-Owens-Ford Glass Co.; and the Dapite Co. of California. The molding powder, which is filled with asbestos or glass, is used almost entirely for electrical connectors.

Shell is still experimenting with the use of diallyl phthalate in laminates, especially the decorative type. It is claimed that DAP will give much better adhesion to asbestos board than any other material. It requires only contact pressure, is simply spread on the surface and laid up to cure. One firm on the West Coast is surfacing Masonite for wall board, bar, counter tops.

Progress in Epons

EPON resins, which are epoxy type polymers, have such great possibilities in so many fields that the plastics industry would be well advised to keep a watchful eye on them. Epons are tough, have excellent chemical resistance and high adhesive qualities, and their electri-

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cal properties are good. One veteran user of specialty materials says that epoxies are the most promising material that has shown up in the industry for the past five years.

Shell Chemical Co. produces epon resins from epichlorohydrin, which is a co-product obtained during the process of producing glycerine from petroleum. The epichlorohydrin is reacted with bisphenol in an average proportion of 0.8 lb. of bisphenol to 0.4 lb. of epichlorohydrin to obtain one lb. of Epon resin. Other chemicals, aside from bisphenol, such as ethylene glycol, could be used but up until now bisphenol has been principally used and is the bottleneck in the industry since it is in limited production.

So far the Epons have not been used as a molding material in this country, but in Europe epoxies are used with phenolic resins to give impact strength somewhat in the same manner as nitrile rubber is used with phenolic in this country.

Surface Coatings—According to Shell spokesmen, the major part of Epon production has been used for surface coatings in trade sales as well as in industrial finishes. In respect to the former, the Epons are used primarily where phenolics or alkyds were previously used, and have the advantage that they can be used with linseed oil, whereas phenolic generally requires a quick drying oil such as chinawood oil or a similar material. Because linseed oil can be used in place of more expensive oils, the cost of the varnish is low despite the high cost of the Epon resins.

In industrial finishes, the Epon resins are used in combination with phenolic, melamine, or urea. When the Epons are modified with drying oils such as linseed mentioned above, they may be air dried. If modified with slow-drying oils, they may be used in baking enamels in combination with melamine and urea-formaldehyde resins. Their chemical resistance is demonstrated by their resistance to such things as lipstick and mustard which can be wiped off without surface damage. Their most spectacular chemical resistance is to alkali, soaps, and detergents. A film containing 70 parts of Epon and 30 parts of a compatible phenolic will show no effect after being boiled in 50% caustic for more than two hours.

Some other uses for Epon coatings, aside from wipe-on varnishes, are wire enamels, porch and deck enamels, appliance finishes, toy enamels, and particularly as prime coats for dairy, brewery, and laundry fields. For example, there is the Epon prime coat on some beer cans, washing machines, and similar appliances. In the latter case, Epons are not always satisfactory for top coats since they give a yellow-white rather than a blue-white finish, but the technicians expect to solve that problem.

Epon resins are also used in printing inks and varnish overcoats for high gloss inks where they give luster and adhesion to ink.

Excellent Adhesive—Other types of Epon resins produced by Shell are used for adhesives, potting compounds, laminating resins, and vinyl stabilizers. They vary in price from 60¢ to $1.25 a lb. with surface coating grades at the lower end and the difficult-to-make potting resins at the higher. A formulated adhesive made from Epon resins costs about $3.75 a lb. and consequently its use is limited, although plastics technologists often claim that it is the "stickingest" of all glues. No solvent is required with this adhesive. However, because of its cost, its use so far as an adhesive has been generally limited to such special applications as metal-to-metal, glass-to-metal, and the like.

Epon adhesives can be cured at room temperature and with only contact pressure, but require at least 48 hr. for full cure in such cases. In order to obtain optimum properties in a practical cure time, temperatures of 165° F., which will effect cure in 2 hr., or 200° F. for 45 min., are recommended.

Potting—As a potting compound, the Epons are particularly valuable because they shrink very little after gelation—much less than other resins. The use of potting compounds has grown considerably over the last few years because of their need in high-frequency electronics, miniaturization, and under-water uses.

Epons are used in laminating for such applications as adhering copper to glass cloth and other fillers for such things as printed circuits. In such cases the Epon acts as both a laminating resin and an adhesive. It is also used as a laminating resin with unfinished glass cloth where it gives exceptionally high flexural strength.

As a vinyl resin stabilizer, Epons are used with barium and cadmium stabilizers, especially where clear transparent film or high color is needed, and alone where non-toxic properties are required. They are also used as a stabilizer in chlorinated paraffin where the latter is used for coating fabric to prevent mildew and insure flameproofness. The Epons act to prevent the chlorine from affecting the fabric.

Shell has received a steel allocation to permit the building of a new plant and expects to have much larger quantities of Epons available when its new plant is completed about one and a half years from now. By that time it is expected that ample bisphenol will also be available from Shell's own facilities.

Tough Styrene Price

IN this column in the April issue an article entitled "Tough Styrene," concerning Monsanto Chemical Co.'s new L-H styrene molding material, stated that L-H sold for 1¢ a lb. over the price of regular crystal styrene. L-H is not available in crystal. It should have been stated that L-H sells for 1¢ a lb. over regular standard colors. It is available in nine stock colors and has a wider color tolerance than regular high impact material.

Fluorelastomer Conference

PROBLEMS encountered in the development of high fluorinated elastomers were discussed at a recent conference at Wright Air Development Center, Dayton, Ohio, under the sponsorship of the Materiel Laboratory, Research Div., Wright-Patterson Air Force Base. The conference was attended by research personnel from various governmental, industrial, and university laboratories concerned with the preparation and evaluation of hitherto unknown fluorine-containing

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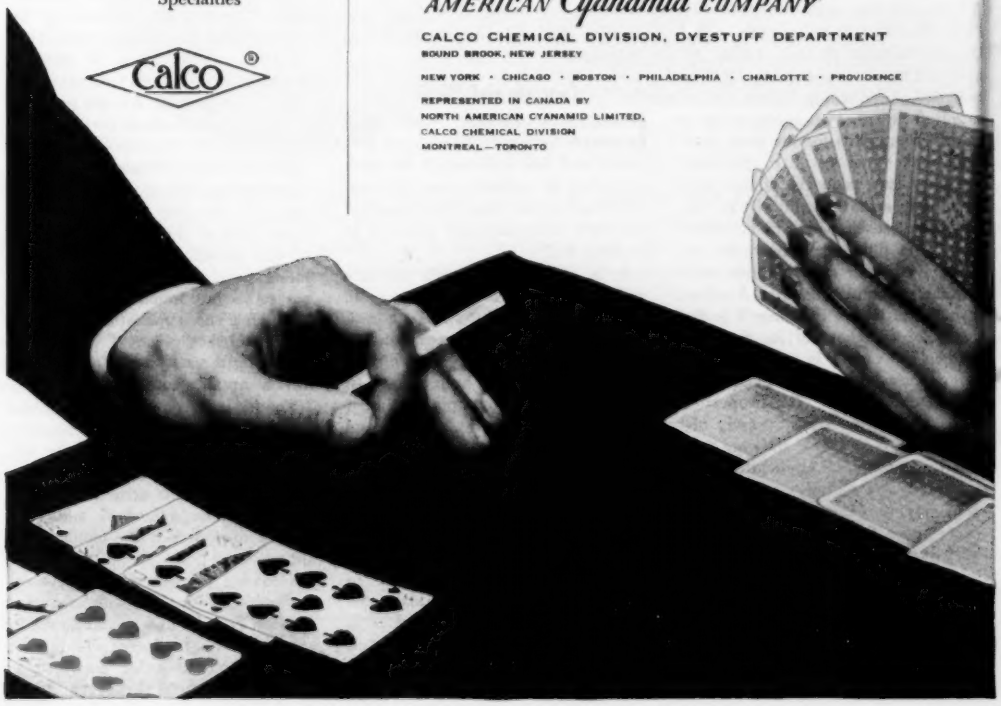

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polymers for specialized military applications. Such polymers, especially those with potentialities as elastomers, are under extensive investigation because of the unique requirements of the Armed Forces for serviceability over an extremely wide temperature range combined with a high order of resistance to attack by fuels, oils, and chemicals in the category of fuming nitric acid.

Basically, the scientists in this case are trying to replace carbon atoms in almost every type of inorganic chemical available with metals such as boron, germanium, and other metals with particularly high resistance characteristics. Progress has been reported in synthesis and polymerization of some of these materials, but it has been pointed out that most of these fluorelastomers have presented unusual compounding and vulcanizing problems of considerable magnitude.

A New Polyvinyl Acetate

A COLLOIDAL water solution of a modified polyvinyl acetate called Darex Polymer Y has been announced by Dewey & Almy Chemical Co., Cambridge, Mass. It is supplied in neutral solution as a translucent, semi-viscous fluid miscible with water in all proportions.

An unusual property of this new polyvinyl acetate solution is the high water resistance of its air-dried films. The films may, however, be redissolved with mild alkalies such as ammonia and soda ash. Another property of Darex Polymer Y is the glass-like clearness of its film.

Since Polymer Y is a colloidal solution, no settling takes place even upon great dilution. The properties of Polymer Y are not adversely affected by freezing and thawing.

Many commercial applications are suggested where polyvinyl acetate emulsions are now used and also where these materials have heretofore been unsatisfactory. Darex Polymer Y is also recommended as a substitute for solvent solutions of polyvinyl acetate.

Chemical plasticizers which are ordinarily used with polyvinyl acetate emulsions may be used to plasticize Polymer Y. Ten percent of a plasticizer is sufficient to give Polymer Y an unusually flexible yet non-sticky film. The plasticizer may be added by direct stirring.

Consultant Agency

WITH the objective of alleviating the problems caused by the scarcity of trained engineering personnel, a new organization, Reinforced Plastic Consultants & Engineers, has been formed with headquarters at 1603 W. 135 St., Gardena, Calif. Services of the new group include development, design, and evaluation of reinforced plastic radar housings for aircraft; design and data specifications pertaining to plastic products; preform molding.

Consultant staff includes Milton Brucker, processes and industrial design; Samuel S. Oleesky, electronics; Charles E. Peach, radar; Sol M. Fingerhut, preform molding; Dr. Robert Steinman, consulting chemist; William Braham, structural and aerodynamic design; and Robert Matlock, consultant design engineer.

Concrete and Plastic

CONCRETE fortified with vinyl acetate for roads, floors, and masonry, and that promises to be twice as strong as ordinary concrete was described at the American Chemical Society's 121st national meeting at Buffalo, N.Y.

It is claimed that this mixture will give increased resistance to cracking, corrosion, abrasion, and impact. The plastic-cement mixture is self-curing in air at ordinary temperatures and humidities. In sharp contrast, many plain cement products require wet curing and are very weak when cured without proper amounts of moisture.

The plastic mixture can also be used as a mortar to repair cracks and as a binder for masonry. When used in this way, the plastic cement mortar is said to be from three to ten times as strong as ordinary cement mortars. The new product is made with one part plastic for each five parts cement used. Because of its great resiliency, the mortar can be used for wall and ceiling plasters.

In laboratory tests, successive freezing and thawing did not appear to effect the original strength of the mix when it had been cured in a moist atmosphere. The specimens cured outdoors during cold weather were found to be considerably weaker than normal.

The paper concerning this material was presented by Severo V. Amagna of the California-Texas Oil Co. and Brian B. Mellor and Professor J. M. Geist of the Massachusetts Institute of Technology.

Their report coincides with a notice recently received here from England stating that substantial quantities of polyvinyl acetate were being used there in cement mixtures for floors around soda fountains. The vinyl acetate helps to give a more resilient finish to the cement and provide a surface that is much easier to keep clean than traditional cement mixtures.

Prospects

THE following notes from a talk by Howard S. Bunn, vice president of Bakelite Co. and Carbide and Carbon Chemicals Co. before the New York Society of Security Analysts are of considerable interest to the members of the plastics industry.

"The present price of phenolic molding material is just one-third of the 1924 price of 60¢ per pound.

"During the postwar period, Bakelite shipments of phenolic and urea materials have increased 30 percent. Considering 1940 as a base, the tonnage for the past two years is 2.4 times that of the base period. Part of this growth came from the normal expansion of the basic industries we serve but much of it was due to finding new applications for these old established plastics."

Among the new uses for phenolic which are expected to take large tonnages in the next few years, according to Mr. Bunn, are foundry molds; wood aggregate and the admixture of 6 to 8% phenolic or urea resin; honeycomb structures made with phenolic adhesives and covered with plywood; and molded furniture.

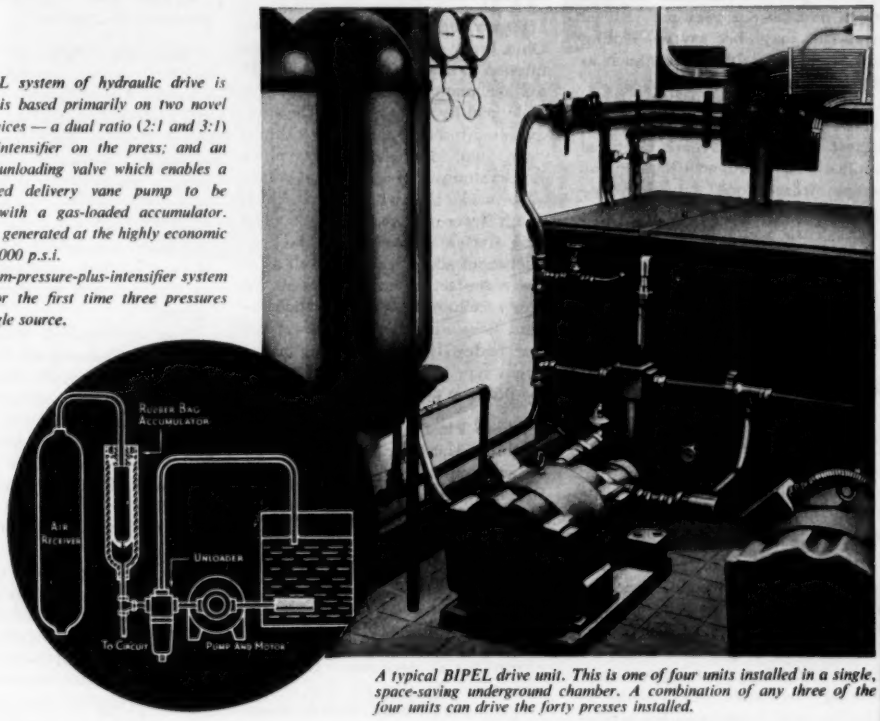
Growing vinyl uses that look most favorable to Mr. Bunn include hard surface flooring and counter tops to compete with linoleum; vinyl sheet for rear windows for convertibles and side curtains in Jeeps; vinyl

Dollar-Saving Drive

FOR WORLD'S BEST AUTO-CONTROL PRESSES

The BIPEL system of hydraulic drive is unique. It is based primarily on two novel BIPEL devices — a dual ratio (2:1 and 3:1) hydraulic intensifier on the press; and an automatic unloading valve which enables a simple fixed delivery vane pump to be combined with a gas-loaded accumulator. Pressure is generated at the highly economic figure of 1,000 p.s.i.

This medium-pressure-plus-intensifier system provides for the first time three pressures from a single source.

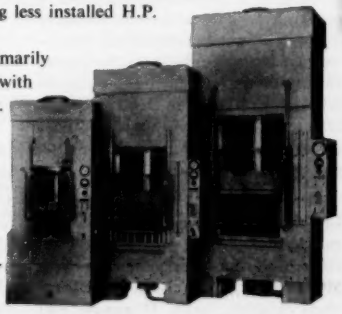


A typical BIPEL drive unit. This is one of four units installed in a single, space-saving underground chamber. A combination of any three of the four units can drive the forty presses installed.

The BIPEL drive system offers a combination of advantages that no other system can offer. It provides a compact, reliable source of hydraulic motive power, cheaper than any other to buy and operate. And, for the first time, it enables a down-stroking prefiller press to provide, from a single supply source, a choice of three molding pressures at will — the initial line pressure followed by intensified pressures of two or three times that figure.

The maximum advantage is derived when the equipment is installed as a group drive feeding a number of presses, up to ten or twelve. Or, as a built-in unit operating a single press, it has many advantages over conventional high-pressure pumps; it still remains simpler and cheaper, requiring less installed H.P. to drive and retaining the feature of three operative pressures.

The BIPEL system, whilst also applicable to manually operated presses, is primarily designed for auto-control which enables the press to reproduce automatically with unvarying precision, any conceivable molding cycle including dwelling and breathing.



BIPEL presses are made in three models, each affording three molding pressures.

TYPE 40: 20, 40, 60 TONS
TYPE 100: 50, 100, 150 TONS
TYPE 200: 100, 200, 300 TONS

BIP GROUP

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coated paper blanks for milk bottles; cross tie pads for railroads where as much as $450 per year per mile of trackage may be saved; clothes lines; and inflatable objects such as toys and beach equipment.

Among the polyethylene items which Mr. Bunn mentioned as the fastest growing today are electrical applications; multi-wall bags; bread wraps; frozen food wrappers; unbreakable bottles; and pipe for mines, rural water lines, wells, and irrigation.

A chart shown by Mr. Bunn indicated that Bakelite plastics sales had grown from about 90 million lb. in 1940 to 380 million lb. in 1951.

EXPANSION

Superior Plastics, Inc., 410 N. Oakley Blvd., Chicago, Ill., has completed construction of a new extrusion unit, with 15,000 sq. ft. of space. Production activities include extrusion of pipe up to 6 in. in diameter.

Barber-Colman Co., Rockford, Ill., has purchased the principal assets of **Wheelco Instruments Co.,** 847 W. Harrison St., Chicago, Ill. The former will continue to produce Wheelco's line of indicating, recording and controlling industrial instruments at Chicago until manufacturing operations can be gradually transferred to Rockford. No changes are contemplated in Wheelco's national sales and service organization.

U. S. Plywood Corp. has opened a new central control laboratory in New York City, which marks the beginning of an expansion program in research and development facilities in the reinforced plastics field. Applications for Fiberglas and the newer resins in flat and compound shaped products suitable for electronics application will be investigated, as well as resin adhesives for bonding metal, plastics, and synthetic fibers.

Barringham Rubber & Plastics Co. Ltd., Oakville, Ontario, has inaugurated an expansion program by concluding a supply arrangement with **Monsanto Canada Ltd.** for Ultron vinyl chloride resins. Monsanto will also provide technical assistance for the development of new products in the vinyl field.

Emery Industries, Inc., Cincinnati, Ohio, has received Government permission to start construction on a $2 million plant for the oxidation of oleic acid by organization. The unit, expected to be in operation within a year, will increase many times Emery's output of azelaic and pelargonic acids, the two products which result from the oxidation of oleic acid. Azelaic acid is used in the production of alkyd resins as well as in the manufacture of plasticizers for vinyls, cellulosics, and synthetic rubbers. Its use is expected to grow as a raw material for polyamides of the nylon type. Pelargonic acid is used for flotation applications.

Presto Plastic Products Co., Inc., is adding 31,000 sq. ft. of space to its 13 acre plant at 54-10 Avenue U, Brooklyn, N. Y. The additional space will house an additional calender which will be served by what is claimed to be the largest Banbury now installed that is working on vinyl compounds. A $250,000 research laboratory with seven chemists has been recently added to the company's facilities. Company spokesmen say that the firm is now producing a 12-color surface printing job, 72 in. wide, that simulates hand painting. The company has also installed special equipment of its own manufacture which has been designed to "mold" film or sheet with remarkable uniformity. The company is also laminating vinyl sheets for dinette sets and kitchen tables.

U. S. Rubber Co. has purchased the Stoughton, Wis., land, buildings, and equipment, of **Milprint, Inc.,** Milwaukee. The new facility, which has 39,000 sq. ft. of floor space, will be used for the production of new products, principally lightweight unsupported and supported plastic films.

Rel Plastics Corp., 475 Boulevard, East Paterson, N. J., manufacturer of sunglasses and toys, has contracted for an addition to its initial plant which was opened six months ago. Officers of the young company are **Lazzaro Fattori, Jr.,** president; **Joseph A. Jackovics,** vice president and director of sales; **Vincent Calcagno,** vice president and sales manager; and **John Lesko,** treasurer. All of the principals were formerly with Columbia Protektosite, except Mr. Calcagno who was formerly vice president of Liggetts.

Monsanto Chemical Co. stockholders were recently told by Charles Allen Thomas, president of the company, that plans are to produce Krilium soil conditioner in presently available equipment at several plants rather than to build a new plant for the purpose at this time. This will allow the company to establish commercial production at the earliest date; substantial amounts of Krilium will be marketed next spring.

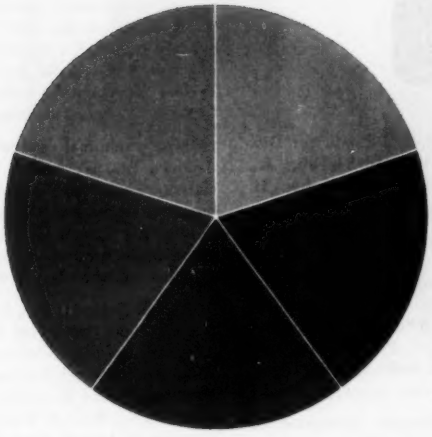
The stockholders were also told that **The Chemstrand Corp.,** which Monsanto owns with **American Viscose,** would begin operations in April and that this fall limited amounts of products made from Acrilan would be available. Acrilan is a synthetic fiber made from acrylonitrile. Chemstrand's nylon plant at Pensacola, Fla., will begin production late in 1953.

The company's new acrylonitrile plant at Texas City, Texas, will be in operation by the end of 1952, and a vinyl chloride monomer plant there will start partial operation in the latter part of the third quarter and will be in full operation by year's end. A large addition to the styrene monomer plant in Texas City will be in operation by the end of the third quarter. A new phenol plant at Avon, Calif., will begin operations early in 1954. A new government-owned chlorine and caustic soda plant at Muscle Shoals, Ala., the largest chlorine plant in the world under one roof, will be half completed and put into operation this May by Monsanto.

COMPANY NOTES

Van de Weghe Corp., 76 Silver St., New Haven, Conn., has been formed by **Marius Van de Weghe,** formerly with **Colt's Mfg. Co.** The new firm will compression mold plastics, and plans to enter the injection molding field shortly.

Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, has named



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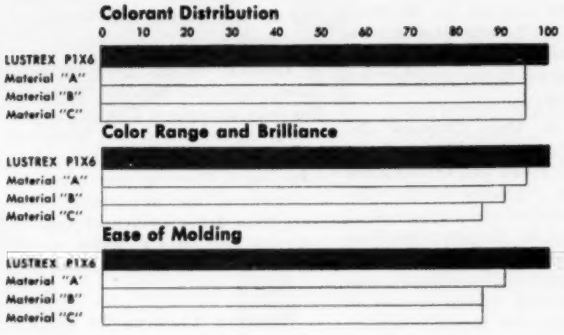

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PLASTISCOPE

David E. Cordier and **Dr. Harold A. Hoppens** as director of research and director of technical service, respectively. They will supervise development and servicing of all types of Plaskon products, including reinforced alkyds and other fiber glass and plastic resins.

Pittsburgh Plate Glass Co. has appointed **G. Donald Campbell** as superintendent and **John A. McMillan** as plant engineer for the Fiber Glass Div.'s Shelbyville, Ind., plant.

Ferro Chemical Corp., Bedford, Ohio, has appointed **James O. Meyers & Sons Co.**, 701 Seneca St., Buffalo, N. Y., as sales agents for western New York for Ferro's metallic soaps, driers, fungicides, and stabilizers. The company also announces the appointment of **William Siegfried** to the research staff where he will work in the vinyl stabilizer research field.

Lincoln Plastics Corp., Cambridge, Ohio, has appointed **M. W. Burkhart** as general manager and **L. M. Wuest** as chief engineer.

Nordan Plastics Corp. has expanded and moved its facilities to 101 Richardson St., Brooklyn, N. Y.

Taylor, Stiles & Co. has set up a testing laboratory at its Riegelsville, N. J., plant for test cutting of plastics, and other materials, to any specified dimensions or fineness.

Bakelite Co. has announced the appointment of **Arthur Falconer, Jr.**, as assistant publicity manager and **George A. Wells** as assistant manager of the Coating Materials Div., Thermosetting Department. Mr. Falconer will work under Don Masson.

Federal Tool Corp., 3600 W. Pratt Blvd., Chicago, Ill., has appointed **Jack Turner** and **Edward Goetz** to its sales staff.

Pittsburgh Coke & Chemical Co. has made the following promotions at the Neville Island plant: **George W. Walther**, general superintendent of chemical operations; **C. R. Sizemore**, manager of basic operations; and **John W. Campbell**, manager of service, maintenance, and construction. The company's Plasticizer Div. has appointed **Edward Vierling, Jr.**, as sales manager and **Walter H. Daub** as sales representative. Both men will make their headquarters in the Pittsburgh home office.

Chemical Plants Div., Blaw-Knox Co., has moved into new and enlarged headquarters on Duquesne Way, Pittsburgh, Pa. The division has named **S. R. Bell** as principal engineer on synthetic resins, plastics.

Bjorksten Research Laboratories, Inc., has formed a Radiochemicals Div. at 323 W. Gorham St., Madison, Wis., to be headed by **Dr. Howard L. Gottlieb.**

Colorite Plastics of New Jersey, Inc., has opened new and enlarged factory and offices at 35 Iowa Ave., Paterson, N. J.

Whiteford Plastics Co., Inc., specialist in extrusion of tubing and large diameter rod, has changed its name to **Extrusion, Inc.**, but remains at the same location, 311 W. 66 St., New York, N. Y. **John Granbery** has been elected president; **Millard Demarest** continues as vice president and sales manager.

Dewey & Almy Chemical Co., Cambridge, Mass., has assigned **Harold W. Flood** and **O. Benjamin Hander** as engineers in the company's plasticizer and polymer plant, respectively. Mr. Hander comes from the Office of Rubber Reserve where he was manager of production control of synthetic rubber. Election of **T. T. Miller** as vice president of marketing and of **George W. Blackwood** as vice president and general sales manager was announced.

Watlow Electric Mfg. Co., manufacturer of industrial electrical heating units, has moved into new facilities at 1376 Ferguson Ave., St. Louis, Mo.

Lester-Phoenix, Inc.'s address was erroneously printed in this column in the April issue. The correct address is 2711 Church Ave., Cleveland, Ohio.

Owens-Corning Fiberglas Corp. has appointed **George Volckhausen** as assistant branch manager of Textile Products in the New York sales office, 16 E. 56 St., and **Paul L. Layton** as a textile sales representative in the west with headquarters at 3445 W. 8 St., Los Angeles, Calif.

Electrochemical Industries, Inc., Jacques St., Worcester, Mass., has been appointed sales and distribution agent by **Bersworth Chemical Co.** to handle the latter's Versens, organic compounds used as stabilizers and inhibitors in the plastics field.

Ross & Roberts, Inc., has merged with **Pollak Industrial Corp.** and will continue to produce calendered and extruded vinyl film and sheeting at Stratford and West Haven, Conn., operating as **Ross & Roberts Co., a division of Pollak. Ross & Roberts Sales Co., Inc.**, 350 Fifth Ave., New York, N. Y., continues as exclusive sales representative.

Naugatuck Chemical Div., U. S. Rubber Co., has appointed three new technical sales representatives for its latex and dispersions sales department. In the Naugatuck, Conn., office, **William J. Curtin** replaces **D. Leete Keefer** who has been transferred to Philadelphia to replace **Gerald L. Dennis** who has been sent to the Los Angeles office as branch manager.

General Electric Co.'s Chemical Div. has named **Robert J. Baumann** as sales manager of silicone products with headquarters at Waterford, N. Y. At the Waterford silicone plant, **Jerome T. Coe** has been appointed manager of sales development, **Robert Treat, Jr.**, supervisor of customer service, and **John F. Bahm**, supervisor of sales administration and control.

Monsanto Chemical Co. has announced the following appointments in its Plastics Div.: **Joshua S. Miller**, assistant branch manager of the New York office; **Sanford E. Glick**, assistant sales manager of thermoplastic molding materials; **Howard A. Gray**, vinyl chloride resins technical sales; **William W. Leichman**, adhesives sales representative for North Carolina and Virginia; **Thomas W. Sears, Jr.**, industrial resins sales in New England; and **Francis E. Woodill**, assistant branch manager for plastics sales in the new Twin Cities sales office.

The Dow Chemical Co. has named

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PLASTISCOPE

A. A. Butterworth as supervisor of plastics sales for the Philadelphia office. He is replaced by **John B. Rutherford** as plastic molding powders salesman in the same office. **A. T. Look** has been appointed superintendent of vinyl chloride and saran plasticizers at Midland, Mich., and is succeeded as coordinator of raw materials and plastics production by **Kenneth G. Harding.**

PERSONAL

Leopold Eckler has recently been named general manager of the Plastics Division of **Celanese Corp. of America. W. Stuart Landes,** vice president in charge of the division who recently completed 31 years of service with the company, is retiring July 1 for reasons of health. Dr. Eckler has been with Celanese since 1948. Previously he was with General Aniline & Film Corp.

George Sollenberger, formerly of Rohm & Haas Co. and more recently chief of the Thermoplastics Section of the Chemical Division of NPA, has accepted the position of sales manager of the Plastics Division of the **Shellmar Corporation,** Mount Vernon, Ohio.

William C. Austin, formerly head of the Polystyrene Molding Powder Sales Division of Bakelite Co., has joined **Wilson Plastics, Inc.,** 1531 Milan Rd., Sandusky, Ohio. Wilson specializes in plastic wall tile but are also custom molders of other thermoplastic products.

William J. Miller comes to **Mystik Adhesive Products** from **Bauer & Black** as special representative for industrial sales. His headquarters are in the firm's executive offices at 2635 N. Kildare Ave., Chicago, Ill.

G. W. Huldrum, Jr., has been promoted to sales manager of the **Western Div., Shell Chemical Corp.** He heads sales activities in solvents for varnishes and lacquers, plastics and resins.

Leroy N. Chellis has left **Auburn Button Works** to join **International Business Machines Corp.'s Plastics Laboratory** at Endicott, N. Y., as a plastics engineer.

T. H. Cleavenger, formerly of **The Koppers Co.,** has been named Chicago regional sales manager for **Anesite Co.,** 2112 Southport Avenue, Chicago, Ill., manufacturer of plastic pipe and custom extrusions.

G. A. Tobey has been promoted to eastern divisional sales manager by **Modglin Co., Inc.,** 3235 San Fernando Rd., Los Angeles, Calif.

William H. Steinkamp, who joined the firm in 1930, has been appointed general sales manager of the industrial division of **Minneapolis-Honeywell Regulator Co.,** Wayne & Roberts Aves., Philadelphia, Pa. **O. B. Wilson** succeeds him as field sales manager.

Lee Stuart has joined the Market Development Dept. of **Heyden Chemical Corp.,** 393 Seventh Ave., New York, N. Y. **Dr. G. M. Sieger** has been transferred to that department from the Research Department.

Dr. Harold C. Beachell, Professor of Chemistry at the University of Delaware, has been elected to the board of technical consultants of **The Iridescent Pigment Corp. of America,** P. O. Box 1605, Wilmington, Del.

Jeffery W. Meyer has rejoined **Wilson & Geo. Meyer & Co.** He will be located at the company's main office at 333 Montgomery St., San Francisco, Calif., where he will handle sale of Tenite molding powder and Kodapak sheet.

Frederick Gardner has been named national sales manager of the **Plastics Div., Plymouth Rubber Co., Inc.,** Canton, Mass. He will maintain sales offices at 267 Fifth Ave., New York, N. Y., for the distribution of the company's line of plastic film for upholstery, automobile seat covers, and so forth.

Joseph A. Snook, associated with **Atlas Mineral Products Co.,** Mertztown, Pa., since 1942, has been appointed vice president in charge of sales.

C. Paul Fortner has been named as assistant director of research for **Plax Corp.,** Hartford, Conn. He was formerly with Du Pont.

Michael A. Brown, Jr., formerly sales promotion manager of the **Plaskon Div., Libbey-Owens-Ford Glass Co.,** has been appointed sales promotion manager of **Rayonier, Inc.,** 122 E. 42 St., New York, N. Y.

John Marshall, inventor of plastic containers for packaging food in individual servings, has joined **Kraft Foods Co.,** Chicago, Ill.

A. L. Robinson has been promoted to manager of the Chicago branch office of **Harwick Standard Chemical Co.,** Akron, Ohio.

Hilton Tarlow, formerly associated with **Peerless Printing Ink Co.,** has been appointed technical director of **Claremont Pigment Dispersion Corp.,** 110 Wallabout St., Brooklyn, N. Y.

Aaron McKay has been named president of **Krylon, Inc.,** 2601 N. Broad St., Philadelphia, Pa., manufacturer of acrylic sprays.

MEETINGS

June 16-19—International Organization for Standardization, Second Triennial General Assembly, Columbia University, New York, N. Y.

June 16-20—Industrial Finishing Exposition, Annual Convention, International Amphitheatre, Chicago, Ill.

June 23-25—Forest Products Research Society, Sixth Annual National Meeting, Milwaukee, Wis.

June 23-27—American Society for Testing Materials, 50th Anniversary and Annual Meeting, Hotels Statler and New Yorker, New York, N. Y.

July 14-18—Western Summer Market, Western Merchandise Mart, San Francisco, Calif.

Sept. 9-13—American Chemical Society, Seventh National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

Sept. 11-13—American Institute of Chemical Engineers, Palmer House, Chicago, Ill.

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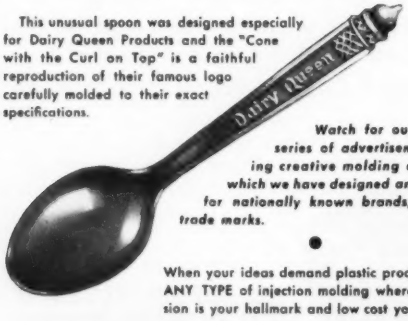

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FOR SALE: 1—22" x 60" 2 Roll Compounding Mill, 150 HP synchronous motor; 1—16" x 42" mill with 75 HP motor; 1—2" oil heated plastics Extruder, motor driven; 1—Stokes R Preform Machine, motor driven. Also Grinders, Extruders, Compression and Injection Molding Presses, Mixers, etc. Send us your inquiries. Consolidated Products Co., 13-14 Park Row, New York 38, N.Y.

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FOR SALE: Thermex Preheater, Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater, Model C B. Like new. AARON MACHINERY CO., INC. WOrth 4-8233, 45 Crosby St., New York 12, N. Y.

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FOR SALE: INJECTION MOLDING MACHINES—1—22 oz. Reed-Prentice; 1—22 oz. Impco; 1—16 oz. HPM; 1—8 oz. Leominster; 1—8 oz. Watson-Stillman; 1—8 oz. Custom-Built; 1—6 oz. Reed-Prentice; 2—4 oz. HPM'S. Reply Box 1538, Modern Plastics.

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FOR SALE: NEW CHROMALOX STRIP HEATERS: 250, 300, 500 & 750 WATT UNITS—In original export packing. Write for specifications. J. F. JOYCE, 1820 Callowhill St., Phila. 30, Pa.

FOR SALE: Injection Presses: 8 & 24 oz. Watson, 12 oz. HPM, 6 oz. Reed, 22 oz. Impco, 3 oz. vert. Munton. 12 oz. DeMattia. 1 oz. Van Dorn. Extruders: 2½" Nat. Erie, Saran Pipe Extruder. Conveyors 40' & 22', 10' Cooling trough. 3 Scrap grinders. Ovens. 150 & 250 T. Transfer presses. 250 T. Laminat. press. Colton E, Stokes T preform presses. Sheridan embossing press. 42" Johnstone slitting machine. List your surplus equipment with me. Justin Zenner, 823 W. Waveland Ave., Chicago 13, Illinois.

FOR SALE: IMMEDIATE DELIVERY—Colton 2 and 3 RP Rotary Tablet Machines. Mikro 15H, 37H, 47H Pulverizers; Jay Bee and Schutz O'Neill Mills. Baker Perkins & Readco Heavy Duty Steam Jacketed, Double Arm 50, 100, 150 gal. Mixers. Baker Perkins 150 gal. D. A. Unidor Jacketed Mixer. Baker Perkins 100 gal. D. A. Vacuum Mixers. J. H. Day from 6 up to 75 gal. Imperial and Cincinnatus D. A. Jacketed Sigma Blade Mixers. Hobart & Read Vertical Mixers from 15 to 120 quart, with removable bowls. Day & Robinson 100 up to 4000 lbs. Dry Powder Mixers. Pony ML and M and Auto. Duplex Labelrites. Package Machy. FA, FA4, Miller, Hayssen 2-7, Scandia Auto. Cellophane Wrappers. REBUILT AND GUARANTEED. This is only a partial list. Over 5000 machines in stock —available at tremendous savings. Tell us your machinery requirements. UNION STANDARD EQUIPMENT CO., 318-322 Lafayette Street, New York 12, N. Y.

Automatic film casting machines (two) for sale. Will handle any film-forming solution. Produce up to 48" and 30" width, .0007" to .002" thick. Capacity 750 to 1000 lb. per 24 hours. In excellent condition. All accessory equipment, patent licenses, and technical know-how included. A bargain at $35,000 f.o.b. Box 1548.

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WANTED: To Expedite Production—Rubber Making Machinery including Banbury Mixers, Heavy Duty mixers, Calenders, Rubber Rolls & Mixers, Extruders, Grinders & Cutters, Hydraulic Equipment, Rotary and Vacuum Shelf Dryers, Injection Molding Machines. Will consider a set up plant now operating or shut down. When offering give full particulars. P.O. Box 1351, Church Street Sta., New York 8, N. Y.

WANTED: REED PRENTICE 8-oz. or 12-oz. or HPM 9-oz. Must be post-war models. Send full particulars to Box 1515. Modern Plastics.

WANTED: 1—2 Roll, 30" Rubber Mill, roll speed not to exceed 1.3, good condition with or without drive. Within 500 mile range. Reply Nichols Engineering, 479 Ferry Blvd., Stratford, Conn.

WANTED: 8, 12 or 16 oz. Reed Prentice Injection Molding Machine; must be less than 5 years old and in good condition; write or wire size, price, year built and where located. Advise if machine is now running. Detroit Plastic Molding Co. 26200 Harper Ave., St. Clair Shores, Michigan.

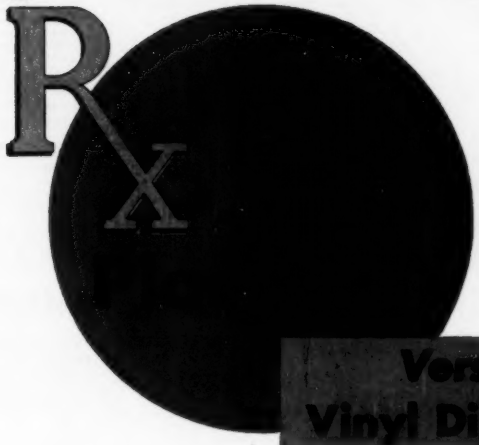
WANTED: New or used 2½" or 3¼" N.R.M. extruders. Also parts such as cylinders, etc. Reply Box 1539, Modern Plastics.

WANTED: Cameron Slitter Rewinder, Type 10-04, 40" rewind capacity, 62" trim width. Will consider other unit similar to above. Write giving details and price. Reply Box 1542, Modern Plastics.

WANTED: Four ounce H. P. M. Injection Molding Press, late model. Reply Box 1551, Modern Plastics.

(*Continued on page 224*)

Buy "Know-How"



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PLASTICS • INDUSTRIAL FINISHES • CHEMICALS

CLASSIFIED ADVERTISING

(*Continued from page 222*)

MATERIALS FOR SALE

FOR SALE: 15,000 pounds VG 1947 Natural Reground Vinylite Injection and Extrusion Powder: Also regular supply of 5000 pounds per month. Reply Box 1536, Modern Plastics.

FOR SALE: 10,000 pounds White Rigid Vinyl Scrap. Reply Box 1537, Modern Plastics.

FOR SALE: 2000 lbs. .006 x 48 genuine vinylite in original containers; 62¢ per lb. Also one Callanan KW high frequency sealing generator and press used only 20 hours; $1300. E. J. KAHN CO., 429 W. Superior St., Chicago, Ill.

FOR SALE: 10 Tons, Fine Ground, Soft, Wood Flour. Packed in 45# Bags. Immediate Shipment. Reply Box 1553, Modern Plastics.

MATERIALS WANTED

WANTED: PLASTIC Scrap or Rejects in any form. Acetate Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 1512, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Terylic Ethyl Cellulose. Reply Box 1513, Modern Plastics.

WANTED: Plastic scrap such as Cellulose Acetate, Vinyls, Acrylic, Ethyl Cellulose, Polystyrene, Butyrate, etc. We also buy surplus inventories of molding powder or grind, clean and reprocess your own scrap. Claude P. Bamberger, Inc., 152 Centre St., Brooklyn 31, N. Y. Tel. Main 5-5553. Not connected with any other firm of similar name.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

SURPLUS UREA MOLDING POWDER WANTED. Reply Box 1516, Modern Plastics.

WANTED: By injection molder—Polystyrene molding powder in any form: scrap, reground, mixed colors, surplus virgin, etc. will purchase on contract basis if desirable. Send samples and best quotations to Waldor Products Molding Co., 132 Mallory Ave., Jersey City, N.J.

WANTED: Royalite and Lucite cut-offs. Large identical pieces preferred. Reply Box 7914, Los Angeles 15, California.

WANTED: Large quantities of Reground or Virgin Polystyrene, Acetate and Buytrate Ethylcellulose in solid colors. We are interested in obtaining a steady supply of these materials. Please send color samples and full description of the materials as well as prices. Reply Box 1518, Modern Plastics.

WANTED: Polystyrene Scrap, both mixed and straight light colors in ground or unground form—Clear and colored Vinyl Scrap film and sheeting, and Clear Cast film scrap. Desire steady supply of these materials. Send samples, quantities available and prices to Box 1525, Modern Plastics.

WANTED: NITRATE SCRAP—.010 plastic scrap in any form, sheets or rolls to as narrow as 1⅝" wide. Due to storage and fire restrictions would prefer to buy in quantities of ten to fifty pounds. Address B & J SPECIALTIES CO., 1265 Harrison St., Noblesville, Ind.

MOLDS FOR SALE

FOR SALE: 2 inch Alphabet Mold; 2 inch Number Mold; 4 inch Alphabet Mold; 4 inch Number Mold. All interchangeable plates. 12 x 12 mold base. Excellent 8 cavity baby food can cover mold for Polythene or Polystyrene. For detailed information, reply Box 1533, Modern Plastics.

FOR SALE: ASH TRAY MOLD, 4 Cavity, to produce Horse Shoe Shaped Tray. 4½" x 3½" with surface for imprinting. Moldings weigh only 57 grams; Very realistic. Samples on request. Best Offer Takes. Reply White Development Corp., 1695 Brentwood Blvd., Brentwood 17, Mo.

MOLDS WANTED

MOLD WANTED for injection molding. We will buy one mold or a complete line or series of molds for finished resalable items. Housewares, toys, novelties, etc. Will also buy molds for industrial parts such as handles, knobs, drawer pulls, gears. All items for resale in U. S. A. Send detailed information to Victory Manufacturing Company, 1722 W. Arcade Place, Chicago 12, Illinois.

WANTED: Molds for injection molding, discontinued Housewares, Bar & novelty items. All items for resale in U.S.A. Send detailed information to Collins Products—Box 465—North Hollywood, Calif.

WANTED: BRUSH MOLDS FOR CASH—Injection molds for ladies, men, military, nail, tooth, brushes, etc. Send particulars and samples. Box 185 Realservice, 110 W. 34 St. N. Y. C.

WANTED: Small bird mold wanted. Send details of mold, number of cavities, cycles etc. Also send samples. Reply Box 1526, Modern Plastics.

We are interested in purchasing stock injection molds for table model radios or personal portables under 2 lbs. in weight. Kindly submit samples and quote mold prices to: Plastic-Ware, Inc., 2 Duane Street, New York 38, N.Y. Att: Mr. Ely S. Margolis.

WANTED: Injection molds for toy horses approx. 2½" to 4" high and toy wheels approx. 2" to 2½" dia. Will also consider buying parts from molds. Large quantities required. Send samples and quotation. Northwestern Products Co., 2721 Spruce, St. Louis, Mo.

HELP WANTED

ASSISTANT FOREMAN for Lucite Royalite and low pressure laminating fabricating plant. Must be able to partly develop and make tooling for deep drawing operations on hydraulic presses. Tool and die-making background will be helpful. Excellent opportunity in old, established and momentarily expanding factory. Reply P.O. Box 7914, Los Angeles 15, California.

Graduate Chemical or Mechanical Engineer for development work in Plastics Laboratory. Three to six years experience required in extrusion or molding of thermoplastics and rubber. Should be capable of independent work on assigned problems. Company retirement and insurance benefits. The Hoover Company, North Canton, Ohio.

PLANT MANAGER: Excellent opportunity for right man to manage new plastic and metal tool and die plant. Location Southern Hemisphere. Manager will be in full charge of 3 Stateside toolmakers and 25 apprentices. Company will pay moving and transportation expenses. Salary generous, commensurate with experience. Here's an opportunity to live and work in a climate identical to Florida in a modern city of over 400,000 population. Operations expected to start June. Reply Box 1524, Modern Plastics, stating age and experience.

Injection-Compression Custom Molder requires the following: 1. Man capable of filling either position of Plastics Engineer or Plant Superintendent. Must be experienced in mold design and quoting. 2. Production Control Manager with experience in such position. 3. Sales Representative, preferably with injection sales background. Salary on all positions open. Emphasis is on quality. Plant is located with 45 minutes of New York City. Reply Box 1528, Modern Plastics.

SALESMEN FOR ESTABLISHED CHICAGO INJECTION MOLDER with capacity to 200 oz. Prefer experience in plastics and capable of giving some engineering service to customer. Will consider men controlling one account or deal. Men required in all industrial areas plus man for Chicago office. Applicant assured excellent cooperation of plant equipped for volume molding, assembly, painting, etc. Give complete details to Box 1514, Modern Plastics.

SALES REPRESENTATIVE wanted—PHENOLIC RESINS. Willing to make commission arrangement if so desired. Our men have been advised about this advertisement. Reply Box 1517, Modern Plastics.

SALESMAN—CUSTOM MOLDED PLASTICS—Progressive Injection Molder in Metropolitan Area desires livewire man with experience in calling on industrial concerns. Would be willing to train someone with proper background. Have own engineering, toolroom, molding and assembling facilities. Salary and commission basis. Submit complete resume stating experience, etc. Confidential. Our staff knows about this advertisement. Reply Box 1554, Modern Plastics.

DEVELOPMENT ENGINEER: Familiar with the formulation and application of resinous material for surface coating. Experience in the application of such materials to continuous webs highly desirable. Submit complete resume, along with recent snapshot and salary requirements. Good starting salary, many desirable employee benefits. Reply Box 1522, Modern Plastics.

WANTED: COMMISSION SALESMAN with a following of buyers of thermosetting plastic molded parts. Established firm doing compression and transfer molding of all types of thermosetting materials. Part or full time basis. SNOW PLASTICS CORP., 5840 So. Oakley Ave., Chicago 36, Illinois.

SALESMAN WANTED: For midwestern Injection molding plant, commission or salary and commission basis. Must have past contacts with injection plastics. Reply Box 1527, Modern Plastics.

JUNIOR INDUSTRIAL ENGINEER—Permanent position with excellent opportunities for advancement with Chicago branch of national company. Experience in methods, time study, etc. Plastic experience helpful but not necessary. Age 23-30. Degree preferred. Submit resume of education, experience and personal data. Please enclose recent snapshot. Reply Box 1552, Modern Plastics.

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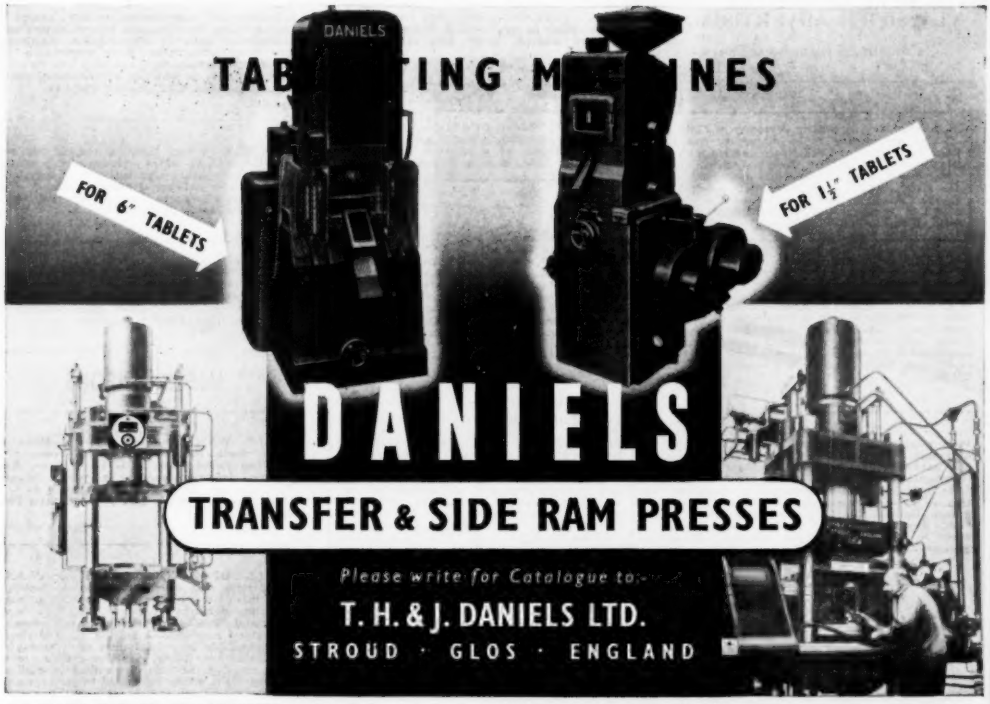

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CLASSIFIED ADVERTISING

(*Continued from page 224*)

Modern expanding plastic Company in Florida has an opening for a man with complete knowledge and practical experience in plastic molding and fabricating. Capable of supervising others. Excellent opportunity for right man to grow along with us. All replies strictly confidential. Jacksonville Metal & Plastics Co., Box 1827, Jacksonville, Florida. Tel. 4-4461.

WANTED: Executive to head up Plastics Division custom molding with prospects of future proprietary items. Man with experience and vision with executive capacity required to manage Plastics Division. Good opportunity for the right man. Reply Box 1530, MODERN PLASTICS.

Well established molder of fast growing and nationally advertised line of plastic housewares and hardware items wishes to contact qualified representatives in the following areas to complete national sales representation. Organization on an exclusive area basis. New England States, Detroit, Cincinnati, Atlanta, Birmingham, New Orleans and Dallas areas. Please reply to Box 1531, Modern Plastics, giving present lines and previous experience.

PRODUCTION MANAGER—For vinyl sheeting factory. Must be experienced. State experience & salary desired. Reply Box 1529, Modern Plastics.

WANTED: VINYL COATING ENGINEER —Experienced in organisols and plastisols. Furnish details of experience first letter. Reply Box 1534, Modern Plastics.

Long and well established custom molding firm in middle west interested in securing representation for high quality, precision thermosetting and thermoplastic plastics applications. Also for new contact molding department. Immediately concerned with Detroit, Cincinnati, and St. Louis areas on exclusive basis. Will assign present accounts. Advise qualifications and previous experience and background. Reply Box 1532, Modern Plastics.

INJECTION MOLDING PLANT, located Southern Michigan requires one assistant foreman and set-up man for day shift and one night shift foreman. Old established progressive company offers year round work in pleasant small town community. Experience desirable, but will consider dependable men with technical background willing to learn. Paid vacation, insurance and security for the right men. Reply Box 1545, Modern Plastics.

Injection and compression molder located in Pennsylvania desires agent representation on a commission basis in Philadelphia, Baltimore, and Washington area. Full cooperation and account protection. Both assembly and finishing work done in conjunction with molding operation. Reply Box 1535, Modern Plastics.

WANTED: Factory Manager for old and well established AA1 rated midwestern manufacturer. Must have experience in compression and injection molding of plastic material. State experience, references, age and expected salary. Reply Box 1546, Modern Plastics.

PLASTICS SALESMAN: Small growing compression and injection custom molding plant requires services of salesman, preferably with experience in field. Salary plus commission. Reply Box 1549, Modern Plastics.

MISCELLANEOUS

MOLDS WANTED—For expert buttons all kinds, tooth brushes, household items, toys, novelties to be used in 2- 4- or 8 oz. Reed Prentice injection molding machines. Wanted also injection molding machines of 2- 4- 8- & 12 oz. capacity. Reply Box 1547, Modern Plastics.

SMALL OPERATING PLASTICS PLANT. Equipment and Business for sale. Equipped with injection molding machines, low-pressure fiberglas molding equipment for Navy boats, industrial coating facilities and chemical laboratory and located in the most desirable and accessible industrial part of Washington, D.C., with spur track. Has tremendous production, research and developmental possibilities for the right group interested in governmental work. Reply Box 1550, Modern Plastics.

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For further information address Classified Advertising Department, Modern Plastics, 575 Madison Avenue, N. Y. 22, N. Y.

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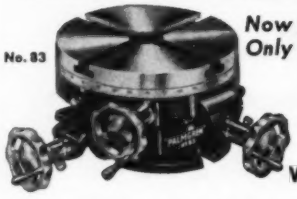

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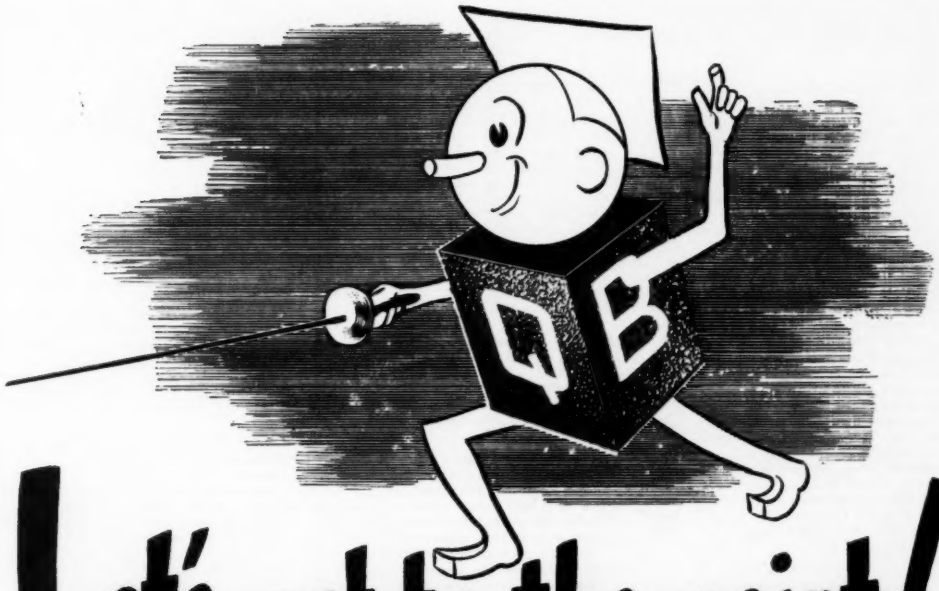

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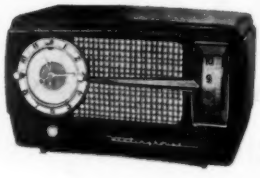

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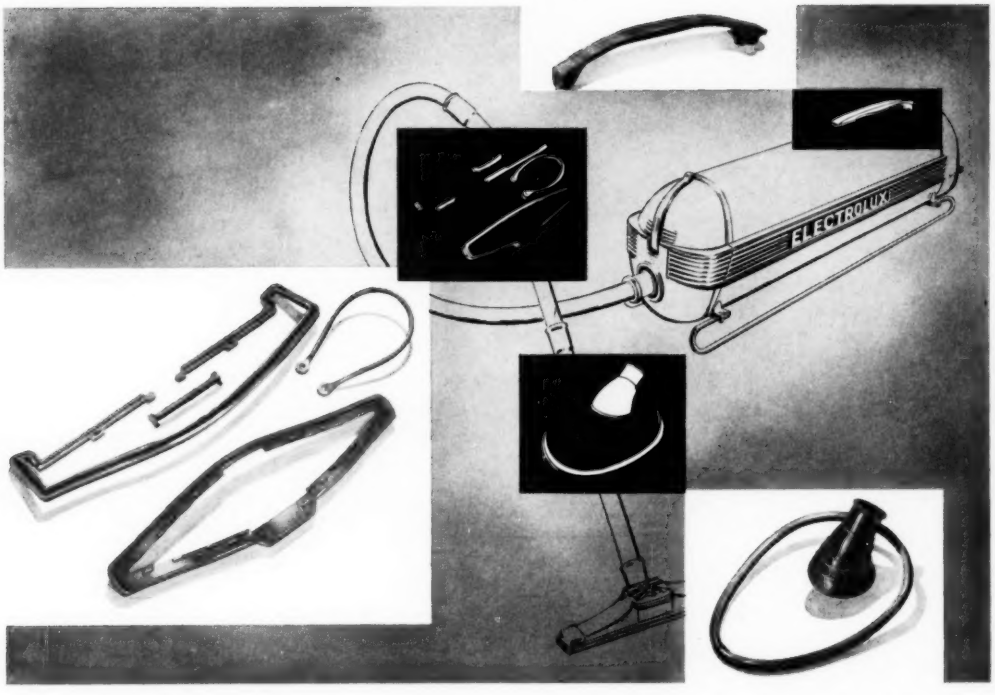

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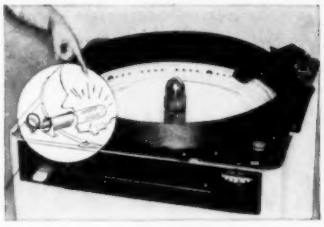

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